

Cryptogenetic Ischemic Stroke : The Role of Patent Foramen Ovale Closure

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Abstract :- Patent foramen ovale (PFO) is an embryonic interatrial defect potentially associated with ischemic cerebral strokes. One option is the occlusion of the atrial shunt by endovascular means. This procedure is recommended for patients with a history of cryptogenic strokes. Patent foramen ovals (PFOs) are common in the general population (prevalence 20-30%) and do not constitute a pathology in their own terms. Nevertheless, an association has been established between the occurrence of certain cryptogenic ischemic strokes and the presence of a PFO. The risk appears higher when septal patency is associated with atrial septal aneurysm (ASA).

The aim of this presentation is to study the association between the PFO and the occurrence of ischemic stroke, and the benefits of its closure.

Keywords:- Cryptogenic ischemic stroke, patent foramen ovale, TEE, PFO closure. Recurrence.

I. INTRODUCTION

Cryptogenic ischemic stroke or stroke of indeterminate etiology refers to ischemic stroke in which no specific cause has been detected after adequate investigation. About 25% of ischemic strokes are cryptogenic: 23% of cryptogenic strokes in the general population, and up to 40% of cryptogenic strokes in young patients (< 50 years of age). Recognition of the contribution of persistent permeability of the foramen ovale (PFO) in the pathogenesis of ischemic strokes has encouraged the proposal of percutaneous closure to prevent recurrence, particularly since the development of interventional transcatheter techniques has made such closure relatively straightforward. However, once this has been established, the problem arises of selecting patients for percutaneous closure of a foramen ovale whose patency is not, strictly speaking, a

malformation, but rather a frequent variant of normal anatomy (1,2).

II. OBSERVATION

Mr S.M, aged 28, with a history of migraine with aura under treatment, suffered an ischemic stroke in May 2020, confirmed on cerebral MRI. As part of the etiological assessment, the Doppler of the supra-aortic trunks was without anomalies, and a thrombophilia test was negative, as was the autoimmunity test. The electrocardiogram (ECG) was normal. On echocardiography ("TTE"), there was no evidence of embologenic heart disease. Since the etiological evaluation was negative, the stroke was classified as cryptogenic. Two years after his ischemic event, the patient was referred to us for re-evaluation and the search for a PFO. At the TTE performed in our department, the diagnosis of PFO was immediately suspected due to the existence of an inter-atrial R-L shunt. Transoesophageal echocardiography (TEE) with contrast test confirmed the R-L shunt in favour of PFO, with an inter-septal space (septum primum et secundum) at 3.5 mm and a tunnel at 14 mm (Fig. 1-3-4), and the presence of an interatrial septal aneurysm (ASIA) (Fig. 2). Given these clinical and paraclinical arguments, we emphasized the link between PFO and cryptogenic ischemic stroke. In order to avoid recurrence and as part of the secondary prevention of this ischemic stroke, the indication of percutaneous closure was retained, based on the criteria for PFO closure according to the 2019 consensus of experts, associating the French Society of Cardiology and the French Society of Neurovascular. The patient's RoPE score, based on age and history of stroke, is 9 points (this indicates that the percentage of stroke attributable to the PFO is 88%, and the risk of recurrence at two years is 2%).

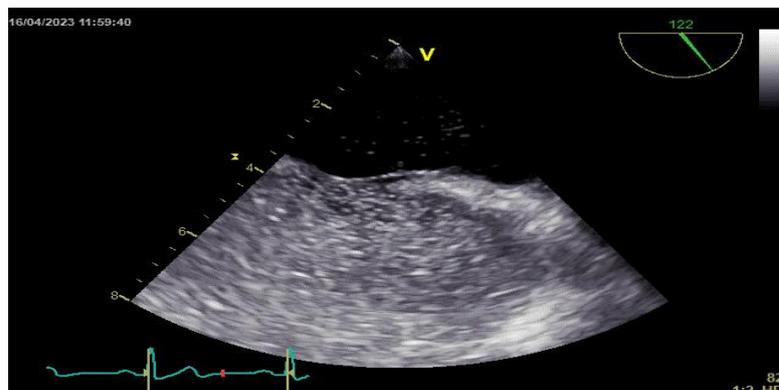


Fig. 1 : TEE contrastography shows the passage of bubbles through the PFO.



Fig. 2 : TEE bi-cavity section shows aspect of interatrial septal aneurysm (ASIA) associated with PFO

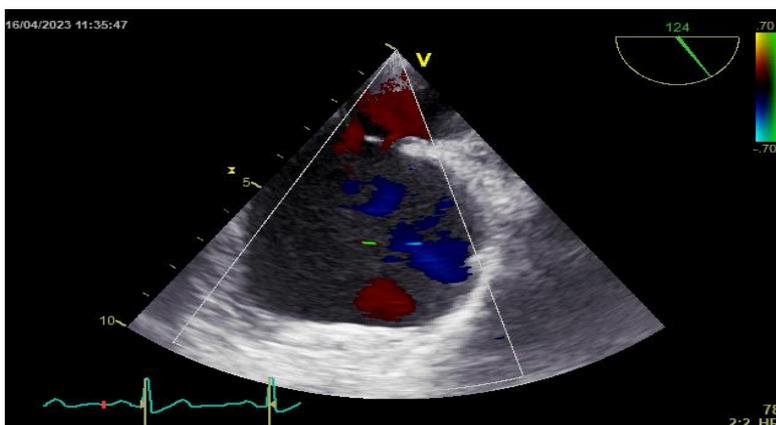


Fig. 3 : TEE image showing the passage of the R-L shunt in color Doppler through the PFO.

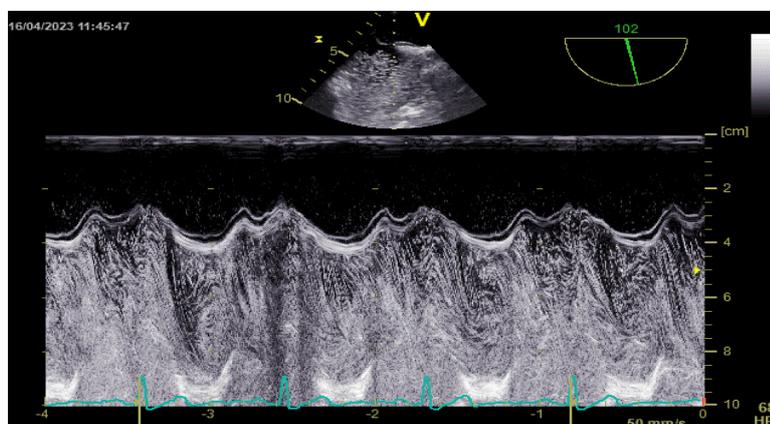


Fig. 4: TEE contrastography in TM section showing the passage of bubbles.

III. DISCUSSION

The presence of a PFO should be regarded as a variant of normal anatomy and not, strictly speaking, as a pathology. In certain circumstances, particularly when right atrial pressure is elevated, the persistence of a PFO allows a R-L shunt and the passage from venous to systemic arterial circulation of thrombi (ischemic strokes and other systemic embolisms), air (divers' decompression sickness) or vasoactive substances (migraines). The occurrence of migraine with aura increases the risk of ischemic stroke by around 2-fold. The presence of a PFO is doubled among patients with migraines with aura, and migraines with aura

are doubled in PFO carriers compared to controls, as in the case of our patient. Migraines with aura are twice as frequent in PFO carriers as in control subjects, as in the case of our patient (1,2).

The prevalence of PFO is 50% in ischemic stroke/TIA patients with no other identified cause (3, 4). Percutaneous closure of the PFO has proved effective in the secondary prevention of ischemic strokes if the PFO is the most reliable cause. This percutaneous closure is recognized as simple and rapid, with a morbidity rate of close to 1% and a mortality rate of less than 0.1%. However, these reassuring statistics and ease of use should not blind us to the need for

careful consideration of the indications for closure (5). First and foremost, it is important to be able to evoke the hypothesis of the existence of a PFO as a cause of any ischemic stroke labelled as cryptogenic, and to go out and look for it. Diagnosis of PFO is fairly straightforward, and relies on the triad of TTE, TEE and transcranial Doppler. TTE is a simple examination, but lacks sensitivity (46%), sometimes showing flow between the 2 atria in apical acquisition of the 4 chambers. TEE remains the reference technique for the anatomical detection of PFO, enabling rigorous analysis of the entire interatrial septum, and identification of factors potentially favouring R-L shunting, such as the CHIARI network and EUSTACHE valve, above all ruling out any associated anomalies (concomitant CIA), revealing other possible stroke etiologies (complex plaque on the aortic arch). Contrast test: can be performed on TTE, and better on TEE, and is considered positive if contrast is observed in the LA during the first 3 cycles after opacification of the right atrium (RA). The passage of contrast is sensitized by the Valsalva maneuver. The transcranial doppler can detect the presence of a R-L shunt and quantify it with a sensitivity and specificity close to those of TEE. It can also diagnose a R-L shunt when at least 1 microembolic signal is recorded in the sylvian artery within less than 9 seconds of intravenous contrast injection. The advantage of this examination lies in the quality of the Valsalva maneuver, which is more reproducible than TEE. Nevertheless, TEE is the reference technique for anatomical characterization of the R-L shunt and interatrial septum, which are:

- Presence of an IASA,
- Tunnel width greater than 2mm,
- Shunt severity greater than 20bubbles,
- Presence of an Eustachian valve or Chiari network, which facilitates R-L shunting and also conditions ease of closure (percutaneous access to the PFO).

The management of a PFO diagnosed during the assessment of a cryptogenic ischemic stroke : is currently being increasingly addressed and based on expert consensus involving cardiologists and neurovascularists, as evidence of the efficacy of percutaneous treatment of PFO during ischemic stroke has finally been established in secondary prevention(4, 5, 6). The results of the Gore REDUCE study, an international multicenter randomized trial, showed that after a median follow-up of 3.2 years, the risk of ischemic stroke recurrence was significantly reduced by closure of the patent foramen ovale (PFO) in addition to antiplatelet therapy, which was used alone in the other group of this comparative study (7). The main difficulty remains the rigorous selection of patients for percutaneous closure. Decisions are taken in a multidisciplinary manner, involving the neurologist, cardiologist, neurovascularist, echocardiographer and interventional cardiologist. The cardiologist's main role remains in the etiological investigation, which is based above all on knowing how to evoke the presence of a PFO in the presence of any ischemic stroke with no cause found.

IV. CONCLUSION

Percutaneous closure of the PFO is safe and effective in the secondary prevention of cryptogenic ischemic stroke in patients under 60 years old, all the more so when the PFO is large and accompanied by an ASIA. The decision whether or not to close the PFO must be carefully considered, following a full etiological assessment, taking into account ultrasound data, the RoPE score and the possible need for long-term anticoagulant therapy. At best, the decision is taken during a multidisciplinary neuro-cardiological consultation, but it ultimately rests with the patient, who will have been given the best possible information.

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