Review Article

Patent foramen ovale in the elderly: what to do?

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The increase in life expectancy makes the diagnosis of PFO a possible and not easily manageable event in patients > 60-years-old due to the presence of different comorbidities and in particular of diastolic dysfunction which is considered as a contraindication to PFO closure. The literature review suggests that aged patients with PFO cannot be excluded “a priori” from PFO closure that should be evaluated for therapeutic options in presence of anatomical and functional indications. Moreover in the elderly many other syndromes than paradoxical stroke mediated by PFO required full assessment and, if needed, transcatheter PFO closure: deoxygenating in obstructive sleeping apnoea, unexplained increased dyspnoea associated with hypoxemia after lung surgery, paralysis of the hemidiaphragm, and platypnea orthodeoxia. Differently from in the young and middle age, the management of PFO in aged patients should obligatory include the careful evaluation of potential comorbidities and eventual contraindications, such as severe diastolic dysfunction due to for example to hypertensive cardiomyopathy and coronary heart disease, the main causes of diastolic dysfunction.

Key Words stroke; patent foramen ovale; elderly; transcatheter closure

Introduction

Patent foramen ovale (PFO) is present in 20-35% of the population and its prevalence varies with age.1 The increase in life expectancy makes the diagnosis of PFO a possible however not easily manageable problem in patients > 60-years-old due to the presence of different comorbidities and in particular of diastolic dysfunction which is considered as a contraindication to PFO closure. In this brief editorial, the authors present the current main concepts of PFO management in the elderly trying to suggest a practical management algorithm.

Statistics in brief

In an old but still valid echocardiographic study, the incidence of PFO in patients aged 70 to 79 years was about a half of patients aged 40 to 49 years (6.15%).2 Moreover, the risk of adverse cerebral events in patients aged 65 years or older was significantly higher in the patients with PFO (P=0.01; hazard ratio=3.21; 95% CI, 1.33 to 7.75; 2-year event rates 37.9% vs 14.5%).3 These studies suggest that aged patients with PFO cannot be excluded “a priori” from PFO closure, and that it should be evaluated for therapeutic options in presence of anatomical and functional indications. Previous larger studies have demonstrated that medium to large shunts, particularly when associated with migraine or coagulation abnormalities, are correlated with an increased risk of paradoxical embolism.4 Transcranial Doppler studies have demonstrated that a shower or curtain shunt pattern identifies significant PFO on transeosophageal Doppler echocardiography (TEE) 5-10 and that a shower or curtain shunt pattern are usually detected in patients with previous presumable paradoxical embolism.

Anatomical characteristics such as atrial septal aneurysm, huge persistent Eustachian valve and Chiari network have been shown to be predisposing factors for paradoxical embolism in patients with PFO.11-14 Patients with PFO plus ASA had multiple acute Diffusion-weighted imaging lesions more often (16 of 30, 53%) than those with PFO alone (3 of 18, 17%; P=0.01). This association remained significant after correction for PFO size, degree of right-to-left shunt and vascular risk factors in a logistic-regression analysis (P=0.04).15 In the study by Santamarina et al,16 an “embolic” pattern was significantly (P=.01) more frequently seen in PFO with ASA patients (n= 37; 44%) as compared to PFO without ASA (n= 22; 26.2%) or no abnormalities (n= 25; 29.8%) on TEE. Univariate analysis revealed that age (P=.06), hyperlipidemia (P=.04), degree of shunt on TEE (P=.002), and the presence of an ASA (P=.008) were associated with an embolic pattern. After adjusting for sex, age, and vascular risk factors, only the presence of PFO, with ASA (OR 7.27; 95% CI 1.5-35.22, P=.014) was independently associated with an embolic pattern.

Finally, it is a fact that PFO transcatheter closure is safe and effective in closing PFO and reducing recurrent strokes: patients with previous recurrent paradoxical embolisms are better treated with percutaneous PFO closure than with medical therapy, as suggested by many observational studies and some meta-analyses.17-18 Transcatheter PFO clo-
sure in elderly patients has been observed to be as safe and effective in preventing recurrent stroke in the older, as in the younger, population. Older patients seem more prone to developing AF.

**Frequent non-neurological conditions amenable to PFO closure in the elderly**

Deoxygenating in obstructive sleep apnoea, a condition frequently present in the elderly, is more prevalent in patients with large PFO (60% versus 13%) than in those without. The median number of passing bubbles is positively correlated to minimum oxygen saturation among patients with PFO. In severely deoxygenated patients, PFO closure may be a viable therapeutic option. After lung surgery, some patients complain of unexplained increased dyspnea associated with hypoxemia. This clinical presentation may be due to an interatrial right-to-left shunt despite normal right heart pressure: the mechanism of increased shunt may be the changing in heart position inside the chest with redirection of blood flow toward the fossa ovalis in presence of a previously insignificant PFO. Again transcatheter closure can achieve symptoms resolution. Paralysis of the hemidiaphragm is a rare condition associated with neoplastic syndromes or abdominal surgery that has been recently recognized as a cause of increased right-to-left shunt. Finally, all the clinical setting worsening the right ventricle function can increase a right-to-left shunting through a previously not significant PFO causing even cyanosis and requiring transcatheter closure.

**Warnings concerning PFO closure in the elderly**

The management of PFO in aged patients should include an obligatory careful evaluation of potential comorbidities and eventual contraindications, such as severe diastolic dysfunction due to, for example, hypertensive cardiomyopathy and coronary heart disease, the main causes of diastolic dysfunction. Severe hypertrophic cardiomyopathy, severe coronary heart disease, and in general restrictive pattern of diastolic dysfunction, have been suggested as absolute contraindications to interatrial shunt closure because it can worsen the left ventricle function. Moreover, the increased frequency in aged patients of carotid artery disease and thoracic aorta plaques require a very careful evaluation of these pathologies during the decision making process.

**Conclusions**

Some useful conclusions for managing elderly patients with PFO can be drawn from this brief literature review. First of all, elderly patients cannot be excluded from PFO closure “a priori”. Second, medium–to-large PFOs especially if associated with a huge persistent Eustachian valve or Chiari network can frequently embolize, also in patients aged over 60 years. Third, careful evaluation of diastolic dysfunction should be employed before any closure attempt because severe diastolic dysfunction should be considered as an absolute contraindication. An occlusion test with a sizing balloon without worsening of left ventricle function can lead to a safe closure. Fourth, aged patients should be evaluated by an integrated protocol which includes transcranial Doppler for assessing shunt grade, transesophageal echocardiography in order to assess not only the shunt but mainly the presence of aortic plaque, diastolic dysfunction grade, heart valve pathology and eventually a stress test to detect coronary artery disease. Finally, only selected aged...
patients can finally proceed safely to PFO closure (Figure 1).

References