Patent foramina ovale in elderly stroke patients

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Summary: Fifty elderly patients who had suffered cerebrovascular incidents from no obvious cause and 33 age-matched controls were investigated for the presence of a patent foramen ovale by contrast 2-dimensional echocardiography at rest and after the Valsalva manoeuvre. Right-to-left shunting was found in only one patient and in none of the controls. This finding is in contradistinction to young adult stroke patients in whom the prevalence of a haemodynamically significant patent foramen ovale is high. Paradoxical embolism is an uncommon cause of stroke in the elderly.

Introduction

In young adults no definite cause for nearly 50% of strokes is established despite extensive investigation.¹ However, recent studies using contrast echocardiography have shown that paradoxical embolism through a patent foramen ovale (PFO) may be a cause for stroke in 40–50% of young patients in whom there is no other obvious identifiable cause.²⁻⁴ Such studies have not previously been undertaken in the elderly. Paradoxical emboli could, though, be an important cause of cerebrovascular incidents in this age group since clinically silent venous thromboses are common⁵ and at autopsy patent foramina ovale have been shown in 20% of elderly subjects.⁶ Further, the average diameter of the foramen in the elderly is wider than in younger adults.⁵

We have used contrast echocardiography to examine elderly patients who developed cerebrovascular incidents from no obvious cause to determine the prevalence of haemodynamically significant patent foramina ovale and hence provide an indication of the frequency of paradoxical embolism in this age group.

Subjects and methods

Two groups were assessed: (1) Thirty-three elderly control subjects (mean age 81 years, range 70–90: 21 female, 12 male) who had no neurological history; (2) Fifty patients aged ≥65 years (mean age 79 years, range 65–95: 29 female, 21 male) admitted consecutively for either a stroke (42) or following a well-documented history of transient ischaemic attacks (8).

The exclusion criteria were a localized carotid bruit, atrial fibrillation, hypertension (blood pressure ≥170/95 mmHg), cardiac valve lesions, cardiac failure, intracardiac thrombus on echocardiography or either a history or electrocardiographic evidence of myocardial infarction. No patient had clinical evidence of an atrial septal defect and all patients were able to perform an adequate Valsalva manoeuvre.

In all patients the full blood count, ESR, blood sugar, clotting studies, chest X-ray and electrocardiogram showed no significant abnormality. Standard 2-dimensional and M-mode echocardiography was undertaken in all patients to detect valvular lesions and intracardiac thrombus.

To perform contrast echocardiography, isotonic saline (10 ml) and 0.5 ml of air were mixed between two syringes mounted on a 3-way tap and, after extruding all macroscopic air, injected rapidly into an antecubital vein through a 21-gauge cannula. Three injections of contrast were undertaken during normal respiration and then repeated after the Valsalva manoeuvre, which was performed by expiring against a mercury manometer to a pressure of 40 mmHg. The 2-dimensional echocardiograms were recorded in the apical 4 chamber view and were judged abnormal if microbubbles appeared in the left atrium or ventricle within three cardiac cycles of their appearance in the right atrium. The echocardiograms were interpreted independently by two experienced cardiologists.
Results

Twelve stroke patients were excluded because of suboptimal image quality, providing a study population of 38 patients (mean age 80 years, range 65–95: 23 female, 15 male) who had had cerebrovascular incidents. Good images were obtained from all the control subjects.

A patent foramen ovale was detected in only one patient and in none of the control subjects.

Discussion

The study has shown a low prevalence of haemodynamically significant patent foramina ovale in elderly people who had suffered cerebrovascular incidents from no obvious cause. This would suggest that many of the patent foramina ovale in elderly people found at autopsy by Hagen et al. were physiologically unimportant. The result is also in marked contrast to studies in young adult stroke patients in whom a high prevalence of haemodynamically significant patent foramina ovale was demonstrated; Lechat et al. identified patent foramina ovale in 54% of stroke patients with no obvious identifiable cause and Webster et al. also obtained similar results. These studies provide further evidence that, especially in young adults, paradoxical embolism is likely to be a more common cause of strokes than is generally appreciated.

One explanation for the low prevalence of patent foramina ovale shown in this study could be that the left heart pressure may be chronically higher in elderly patients and right atrial pressure may not have been raised enough during the Valsalva manoeuvre for sufficient right-to-left cardiac shunting to allow microbubble passage and detection in the left side of the heart. Further, contrast echocardiography has additional problems when applied to ill elderly patients; in this study, involving poorly mobile stroke patients, a satisfactory image could not be obtained in 12, whilst some also had difficulty performing a Valsalva manoeuvre to 40 mmHg. It is, however, a relatively non-invasive technique and detects right-to-left shunting through patent foramen ovale with a sensitivity and specificity of 100% and 78% respectively.

In conclusion, patent foramen ovale are a common anatomical finding in elderly people, but the results of this study suggest that paradoxical embolism is an unusual cause of cerebrovascular incidents in this age group.

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References

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