

Figure 2. Echocardiographic image of both ventricles following agitated saline solution administration in peripheral vein in patient 3. Opacification of the right ventricle is shown and passage of bubbles to the left ventricle through the interatrial septum. For diagnosis, the passage of bubbles from the right to the left heart cavities should occur in the first three beats after opacification of the right heart cavities.

upright position and with the slightest exertion. The patient improved slightly with oxygen therapy and was practically normal when supine. Chest computerized tomography was normal. The echocardiogram showed no abnormalities, except the IAS aneurysm. Estimated pulmonary pressure was normal. Using agitated saline transthoracic echocardiography, we found innumerable bubbles flowed from the right to the left atrium, both at baseline and following the Valsalva maneuver (Figure 2). Transesophageal echocardiography showed the existence of PFO and we diagnosed POS due to PFO triggered by changes in the anatomic disposition of the IAS following thoracotomy. Cardiac catheterization confirmed the diagnosis and a Cardia UltraSept PFO device was implanted, with excellent angiographic and echocardiographic results. After the procedure, the patient presented immediate clinical recovery, with normalization of oxygen saturation in an upright position and normal tolerance to exertion.

These 3 cases show different clinical presentations of the entity and illustrate its varied diagnostic process. The first case shows a form of subclinical presentation in a patient with a low level of

physical activity in whom the syndrome was uncovered by positive-pressure mechanical ventilation. The second case shows how patients with POS and chronic respiratory insufficiency often undergo years of symptoms before receiving a diagnosis. The third case shows an acute presentation, with highly debilitating symptoms, following cardiac surgery. Note that, in terms of the diagnostic process, the first case enabled us to recognize the syndrome; the second, to confirm its presence in patients with respiratory insufficiency of unclear origin; and the third, to show how simple the diagnosis can be, given awareness of the clinical characteristics.

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Differences in the Prevalence of Complex Aortic Atheromatosis by Type of Stroke



Diferencias en la prevalencia de atheromatosis aórtica compleja según el tipo de accidente cerebrovascular

To the Editor,

Researchers are increasingly interested in the study of complex atheromatosis of the aortic arch (plaque thickness ≥ 4 mm, ulceration, or mobile elements) by transesophageal echocardiography because such lesions are a potential major origin of emboli in different types of cryptogenic cerebral ischemia. The prevalence of complex AA was found to be approximately 7.6%.¹ Several studies confirm the higher frequency of complex aortic atheromatosis (AA) among patients with ischemic stroke or transient

ischemic attack (TIA) compared with healthy controls. However, we lack in-depth knowledge of the prevalence of complex AA associated with these different clinical presentations of an ischemic event. The objective of this study was therefore to assess the possible differences between stroke and TIA.

The study was a retrospective observational study of 100 consecutive patients attended between 2004 and 2011 (50 with stroke and 50 with TIA). These patients had been referred for transesophageal echocardiography due to cryptogenic cerebrovascular accident after a complete diagnostic work-up that included electrocardiogram, chest radiograph, brain computed tomography/magnetic resonance imaging, Doppler ultrasound of the supra-aortic arteries (in 3 patients in the stroke group and in 2 in the TIA group of mild carotid stenosis), brain magnetic resonance angiography, blood tests to rule out hypercoagulation, and conventional transthoracic echocardiography. The 2 types of

event were differentiated according to whether infarcted tissue was detected in the central nervous system by the imaging techniques recommended at the time.² Patients with intracerebral or subarachnoid bleeding and evidence of atrial fibrillation and those younger than 18 years were excluded.

Of the 100 patients included initially, 17 were excluded (8 [16%] in the TIA group and 9 [18%] in the stroke group) due to patent foramen ovale that was not detected by conventional transthoracic echocardiography. Therefore, the final sample comprised 83 patients. None of the patients had thrombi in the left atrial appendage.

Aortic examinations were undertaken according to the current recommendations of the European Society for Cardiology using a multiplanar transesophageal probe (2.9-7.0 MHz) connected to a Vivid7 (GE, Vingmed, Horten, Norway) echocardiography unit. Complex AA was defined as maximum plaque thickness ≥ 4 mm and presence of ulcerations or mobile elements within the plaques.

The clinical characteristics of the groups are shown in the Table. Stroke patients were older than TIA patients and had a worse cardiovascular risk profile (classic risk factors), although these differences were not significant. The prevalence of total and complex AA in the stroke group was significantly greater than in the TIA group (17.1% vs 0%; $P=.005$; and 12.2% vs 0%; $P=.022$, respectively), as shown in the Figure.

Of the 5 stroke patients with complex AA, 3 (60%) had a plaque thickness > 4 mm and 2 (40%) had mobile elements within the plaque. Oral anticoagulation was indicated in these patients.

Some studies have shown that complex thoracic aortic plaques, whether detected by transesophageal echocardiography or during autopsy, are much more frequent in patients with stroke than in controls.³ Although complex AA has not been associated with an increase in the primary risk of ischemic stroke in prospective studies, its presence has been considered a risk factor for recurrence.⁴

Very few studies have investigated whether there is a difference in AA prevalence between patients with ischemic cerebral stroke and TIA. In a retrospective study of 519 patients with complex AA, Tunick et al⁵ found that 50% had stroke, 35% TIA, and 14% peripheral embolism.

Aortic atherosclerotic plaques are considered a manifestation of systemic atherosclerosis and associations have been found with classic cardiovascular risk factors, old age, and coronary artery

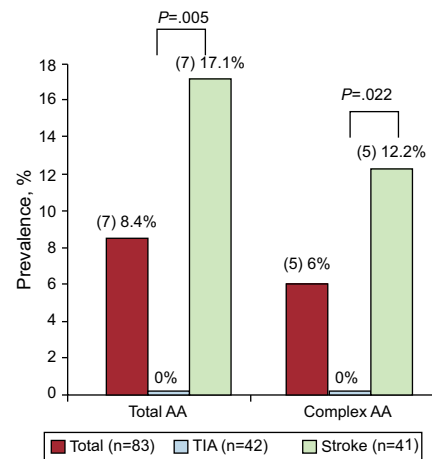


Figure. Prevalence of total and complex aortic atheromatosis in patients with transient ischemic attack and stroke. AA, aortic atheromatosis; TIA, transient ischemic attack.

disease.⁶ In the present study, the findings could be partly explained by the greater cardiovascular risk, the greater percentage of men, and slightly older age in the stroke group compared to the TIA group. However, certain TIA episodes have been linked to fluctuation in cerebral artery flow, while atheroembolic mechanisms are not involved as in stroke.

Despite its small size, the study is important because it shows that patients with ischemic cerebral infarction of unknown origin have a higher prevalence of complex AA than those with TIA. Indeed, no cases of complex AA were found in this latter group. The most relevant conclusion probably pertains to the possible therapeutic and prognostic implications, given the indication of oral anticoagulation in patients at greatest risk of embolism (mobile elements adhering to the plaque) and the risk of recurrence of stroke.

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Table

Clinical Characteristics of the Sample

	All (n = 83)	TIA (n = 42)	Stroke (n = 41)	P
Age, mean (SD), years	43.5 (11.2)	42.1 (9.4)	44.9 (12.7)	.26
Men	45 (54.2)	16 (38.1)	29 (70.7)	.003
Smokers	26 (31.3)	10 (23.8)	16 (39)	.13
Hypertension	13 (15.7)	5 (11.9)	8 (19.5)	.34
Dyslipidemia	23 (27.7)	11 (26.2)	12 (29.3)	.75
DM	9 (10.8)	3 (7.1)	6 (14.6)	.27
Previous stroke	19 (22.9)	7 (16.7)	12 (29.3)	.19
Ischemic heart disease	1 (1.2)	0	1 (2.4)	.49
Total AA	7 (8.4)	0	7 (17.1)	.005
Complex AA	5 (6)	0	5 (12.2)	.022

AA, aortic atheromatosis; DM, diabetes mellitus; SD, standard deviation; TIA, transient ischemic attack.

Unless otherwise indicated, the data are expressed as No. (%).

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Transcatheter Aortic Valve Replacement With a Balloon-expandable Valve for the Treatment of Noncalcified Bicuspid Aortic Valve Disease



Reemplazo percutáneo de la válvula aórtica con una válvula de balón expandible para el tratamiento de la enfermedad valvular aórtica bicúspide no calcificada

To the Editor,

A 71-year-old woman diagnosed with symptomatic aortic stenosis (exertional dyspnea, New York Heart Association class III) and hostile chest was referred to our hospital for transcatheter aortic valve replacement (TAVR). She had undergone off-pump coronary bypass artery grafting several years previously, complicated with severe mediastinitis and sternal dehiscence requiring surgical intervention and chest reopening. She also had systemic arterial hypertension, type 2 diabetes, peripheral vascular disease, and chronic renal failure leading to an estimated risk of perioperative mortality of 21% and 6% as assessed by Logistic EuroSCORE and Society of Thoracic Surgeons score, respectively. The echocardiographic examination revealed a noncalcific bicuspid aortic valve with severe stenosis (mean gradient, 41 mmHg; valve area as assessed by the continuity equation, 0.54 cm²) (Figure A), and a left ventricular ejection fraction of 60%. A multidetector computed tomography confirmed severe thickening of the leaflets and the absence of calcium on the aortic valve (Figure B), severe calcification of the ascending aorta without significant dilatation (Figure B) and severe peripheral vascular disease with concentric calcification of both iliofemoral arteries and a minimal luminal diameter of 5.5 and 4.7 mm in the right and left side, respectively. The patient was deemed unsuitable for standard aortic valve surgery by the heart team, and TAVR using the transapical approach was proposed. The case was approved by the Special Access Program for compassionate clinical use of Health Canada, and the patient provided signed informed consent for the procedure. According to the assessment of the dimensions of the aortic annulus by multidetector computed tomography (21 x 27 mm; area, 4.7 cm²), a 26-mm balloon-expandable Edwards SAPIEN-XT valve (Edwards Lifesciences, Irvine, California, United States) was selected and, following balloon valvuloplasty with a 20-mm balloon, the transcatheter valve was successfully implanted (Figure C). The echocardiographic examination post-TAVR showed the

absence of residual aortic regurgitation (Figure D) and a valve area of 1.31 cm². At 1-month follow-up, a multidetector computed tomography showed both the adequate positioning and uniform expansion of the bioprosthesis (Figure E). Valve hemodynamics remained unchanged and the patient was asymptomatic at the 9-month follow-up.

Bicuspid aortic valve disease (BAVD) is the most common congenital heart defect and the first cause of aortic stenosis requiring aortic valve replacement. Although most cases occur in calcified valves, severe aortic stenosis in BAVD may occur in thick and fibrous valves lacking calcium, which is more frequent in younger patients.

Both the presence of a BAVD and the absence of calcium on the aortic valve are contraindications for TAVR¹ due to the potential risk of valve dislodgment. Valve calcification is considered to be a necessary condition for the anchoring of the valve stent frame, which might be even more relevant with the use of balloon-expandable valves. However, studies in animal models have shown that an accurate sizing of the valve with a higher degree of prosthesis oversizing may prevent device migration in valves without calcium.²

The use of self-expandable bioprostheses in noncalcified aortic valves allows a high oversizing with a minimal risk of annulus rupture. Nonetheless, the higher radial force of the balloon-expandable valves³ may allow an appropriate anchoring of the bioprosthesis in noncalcified valves with less oversizing.² In this case, a relative oversizing of 13% (within the recommended range of 10%–15%) was enough to prevent bioprosthesis embolization,⁴ but future studies will have to determine the degree of oversizing which should be used in these cases. Also, the eccentricity of the aortic annulus and the severe thickness of the leaflets in this patient might have contributed to resistance to migration forces. Moreover, the use of self-expandable bioprostheses in patients with BAVD has been associated with a greater eccentricity,⁵ which in turn might lead to a higher peak stress on the leaflets and a higher risk of central and paravalvular leak.⁶

Several series have reported the feasibility of TAVR in patients with calcified BAVD.⁵ However, this report shows for the first time that TAVR with the use of balloon-expandable valves can be successfully performed for the treatment of noncalcified BAVD, suggesting that TAVR might be a therapeutic alternative in selected patients with congenital aortic valve disease without valve calcification. Further studies are warranted.