



Atrial septal aneurysm: Prevalence and covariates in adults

Ertan Yetkin ^{a,*}, Hakan Atalay ^b, Mehmet Ileri ^c

^a Middle East Hospital, Division of Cardiology, Mersin, Turkey

^b Middle East Hospital, Division of Cardiovascular Surgery, Mersin, Turkey

^c Numune Training and Research Hospital, Department of Cardiology Ankara, Turkey



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ABSTRACT

Background: Atrial septal aneurysm is a localized deformity of interatrial septum, generally at the level of fossa ovalis which protrudes into right or left atrium or both. The purpose of this study was to assess the frequency and covariates of atrial septal aneurysm in adult patients undergoing transthoracic echocardiography in our outpatient clinic.

Materials and methods: From December 2011 to May 2016, 16,570 patients were included in the study. Records of patients were retrospectively analyzed from our previously established database. All cardiovascular examinations and echocardiographical examinations had been done during this period. Briefly, protrusion of interatrial septum more than 15 mm into the right or left atrium with an at least 15 mm diameter base of interatrial septum confirmed the diagnosis of atrial septal aneurysm.

Results: Atrial septal aneurysm has been documented in 393 patients (2.4%) in our study population. Mild to moderate mitral and aortic valve regurgitation have been demonstrated in 153 (39%) patients and in 61 (16%) patients respectively. Sixty one (16%) of patients had the diagnosis of supraventricular arrhythmia of whom 52% underwent radiofrequency ablation procedure.

Conclusion: In conclusion we have documented that valvular regurgitation and supraventricular arrhythmias are common concurrent pathologies with atrial septal aneurysm.

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1. Introduction

Atrial septal aneurysm is a localized deformity of interatrial septum, generally at the levels of fossa ovalis which protrudes into right or left atrium or both [1]. Atrial septal aneurysm can be a primary malformation involving the region of fossa ovalis or but also may be secondary to interatrial pressure differences [2]. It may exist for an isolated abnormality, but is often found in association with other structural cardiac abnormalities, e.g., mitral valve prolapse or atrial septal defects, and patent foramen ovale [3–6]. Although the prevalence of atrial septal aneurysm in childhood ranges from 0.9% to 1.7% [7,8], in adults the reports of prevalence mainly depend on the stroke oriented studies and ranges 1.9% to 10% [1,9–11].

The purpose of this study was to assess the frequency and covariates of atrial septal aneurysm in adult patients undergoing transthoracic echocardiography in our outpatient clinic.

2. Materials and methods

From December 2011 to May 2016, 16,570 patients were included in the study. Records of patients were retrospectively analyzed from our previously established database.

* Corresponding author at: Yenisehir Hospital, Division of Cardiology, Pozcu, Mersin, Turkey.

E-mail addresses: ertanyetkin@hotmail.com, ertanyetkin@vasmolcardiol.org (E. Yetkin).

All patients who were examined in our outpatient clinic also underwent echocardiographic examination. All cardiovascular examinations and echocardiographic examinations had been done by the single and same cardiologist during this period. Ethic Committee of Numune Training and Research Hospital approved the study design and protocol (E16-922). Diagnosis of atrial septal aneurysm had been done according to the criteria published by Handley et al. [2]. Briefly, protrusion of interatrial septum more than 15 mm into the right or left atrium with an at least 15 mm diameter base of interatrial septum confirmed the diagnosis of atrial septal aneurysm (Fig. 1). Transthoracic echocardiographies were obtained with the use of Vivid3 Pro System (General Electric Medical Systems, Milwaukee, Wisconsin, USA) with a 2.5 MHz phase array probe. Patients underwent standard views including parasternal short and long-axis, apical four and five chamber views and as well as suprasternal and subcostal views when needed. A patent foramen ovale was defined as the right to left inter-atrial shunt diagnosed by intravenous injection of agitated saline with the patient at rest and with provocative maneuvers (cough or release of valsalva). All procedures followed were in full accordance with the recommendations of the American Society of Echocardiography [12]. Severity of mitral valve regurgitation and aortic valve regurgitation were assessed as mild, moderate and severe based on the color flow regurgitation jet in mitral valve and pressure half-time in aortic regurgitation defined in the recommendation of European Association of Echocardiography [13,14]. Transesophageal echocardiography was performed according to practice guidelines. Briefly esophageal intubation was performed with the patient in the fasting state and in the left lateral decubitus position, after premedication with topical anesthesia (lidocaine). Transesophageal echocardiography was not applied to all patients. It was performed either to confirm the size of the atrial septal defect or to rule out the presence of atrial septal defect when there is uncertainty by transthoracic echocardiography. Transesophageal echocardiography projections and measurements were made according to the American Society of Echocardiography guideline [12]. Patients with mitral stenosis or mitral prosthesis or who had any cardiothoracic surgery involving the atrial septum were excluded from the study. Chronic obstructive lung disease with cor pulmonale, left ventricular ejection fraction <40% were also an exclusion criteria for the atrial septal aneurysm enrollment. The patient

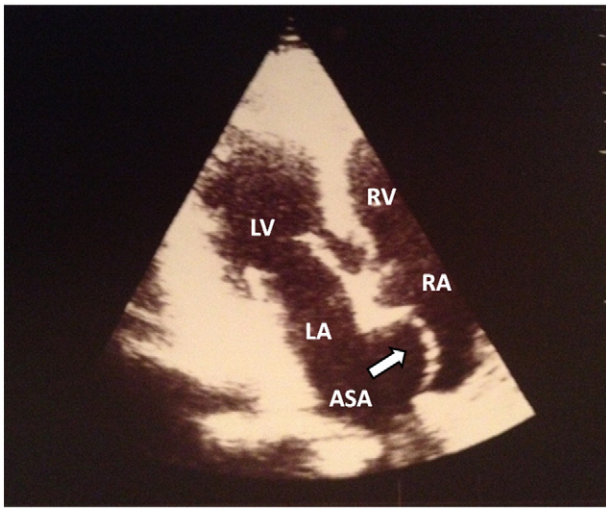


Fig. 1. Apical four chamber view of atrial septal aneurysm by transthoracic echocardiography. White arrow, showing interatrial septum protruding into right atrium. ASA; atrial septal aneurysm, LV; left ventricle, LA; left atrium, RV; right ventricle, RA; right atrium.

records were evaluated for history, in particular clinical events compatible with arterial embolism, cardiac rhythm, history of arrhythmias and known diseases related with other systems. The diagnoses of events compatible with cardiogenic embolism were based on clinical criteria (sudden onset of symptoms, exclusion of significant [$>30\%$ stenosis] carotid artery disease by Doppler sonography), and technical investigations (nonhemorrhagic stroke established by computed tomography, or magnetic resonance imaging peripheral arterial occlusion established by angiography and/or surgery).

3. Results

A total of 16,570 patients were enrolled in the study. Of whom 393 patients fulfilled the inclusion criteria and echocardiographic criteria of atrial septal aneurysm (2.4%). Fourteen patients with atrial septal aneurysm were not included in the study because of having left ventricular ejection fraction $<40\%$, chronic obstructive lung disease with cor pulmonale and having mitral stenosis out of 393 patients. The demographical and clinical characteristics of these patients are reported in Table 1. Two hundred and eighty four patients (72%) were female, with a mean age of 46 ± 16 years. Patent foramen ovale in 30 (8%), and atrial septal defect in 15 patients (4%) have been documented during this period. Concurrant cardiac abnormalities are listed in Table 2. Mild to moderate mitral and aortic valve regurgitation have been demonstrated in 153 (39%) patients and in 62 (16%) patients respectively. Mitral valve fenestration and ventricular septal defect were observed in one patient. Mitral annular or aortic valvular calcification was noticed

Table 1
Demographical and clinical characteristics of patients with atrial septal aneurysm.

Age (years)	47 ± 16 (18–80)
Gender (female)	284/393 (72%)
Hypertension	109/393 (28%)
Diabetes mellitus	43/393 (11%)
Hyperlipidemia	63/393 (16%)
Coronary artery disease	32/393 (8%)
Main presenting symptoms	
Chest pain	160 (41%)
Palpitation	113 (29%)
Dyspnea	75 (19%)
Syncope	11 (3%)
Stroke	4 (1%)
Amaurosis fugax	3 (1%)

Table 2
Echocardiographic finding in patients with atrial septal aneurysm.

Left ventricular end-diastolic diameter (cm)	4.52 ± 0.38
Left ventricular end-systolic diameter (cm)	2.82 ± 0.31
Aortic root diameter (cm)	2.85 ± 0.34
Left atrial diameter (cm)	3.63 ± 0.49
Ejection fraction (%)	66 ± 4
Mitral regurgitation	153 (39%)
Mitral valve prolapse	3 (1%)
Mitral valve fenestration	1 (0.3%)
Aortic regurgitation	62 (16%)
Ascending aortic aneurysm	19 (5%)
Chiari Network	2 (1%)
Patent foramen ovale	30 (8%)
Atrial septal defect	15 (4%)
Ventricular septal defect	1 (0.3%)

in 35 patients (9%). Ascending aortic aneurysm with the definition of aortic root diameter >4 cm was diagnosed in 19 patients (5%) (Table 2).

At the time of outpatient clinic examination 311 patients (79%) were in normal sinus rhythm with no electrocardiographic abnormalities, 15 patients (4) were in atrial fibrillation, and one had a pacemaker rhythm. The remaining patients had ischemic electrocardiographic changes, or, left bundle branch block, right bundle branch block (Table 3).

Chest pain, palpitation and dyspnea are the most common presenting symptoms. Three patients had documented or clinically manifested stroke and 3 patients had the complaints of amaurosis fugax of whom none of them had documented atrial fibrillation or carotid artery stenosis. 35% of patients (119 of 393) for whom detailed information was available had complaints of palpitation, or arrhythmia related symptoms such as syncope, lightheadedness or dyspnea. Overall, supraventricular tachyarrhythmias were noted in 76 patients of whom 15 had paroxysmal or chronic atrial fibrillation. Additionally, 15% of patients have been diagnosed as having frequent premature atrial and/or ventricular beats and given to anti-arrhythmic treatment (Table 4). Of those who had arrhythmia related symptoms, 47 patients underwent electrophysiological study. During electrophysiological evaluation, 6 patients were scheduled to cardiac pacemaker implantation because of conduction abnormalities, 32 patients (8%) underwent ablation procedure atrio-ventricular nodal reentrant tachycardia, atrio-ventricular reentrant tachycardia or atrial tachycardia. Of note, only 126 patients (32%) had any of the echocardiographic, electrocardiographic abnormalities discussed above and findings related to atrial septal aneurysm such as stroke or amaurosis fugax.

4. Discussion

The overall prevalence of atrial septal aneurysm in our study population is 2.4% by transthoracic echocardiography. Although this is not a population based screening study, due to large number of patients included in the study we can assume that this prevalence might reflect the general adult population. Prevalence of atrial septal aneurysm in pediatric population ranges 0.9% to 1.7% by transthoracic echocardiographies [7,8]. However, in adults, the reports of prevalence mainly depend on the stroke oriented studies ranging 1.9% to 10% [1,9–11] in which transesophageal echocardiography is the main diagnostic tool. Secondly there is a female predominance of 72% in atrial septal

Table 3
Electrocardiographic findings in patients with atrial septal aneurysm.

Normal electrocardiogram	311 (79%)
Right bundle branch block	13 (3%)
Left bundle branch block	5 (1%)
Atrial fibrillation	6 (2%)
Ischemic changes	47 (12%)
Wolf Parkinson White Syndrome	1 (0.3%)
Atrio-ventricular block or bradycardia	6 (2%)

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