

Atrial Septal Aneurysm: A Study in Five Hundred Adult Patients

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Abstract

Introduction: Today, atrial septal aneurysm (ASA) is well recognized pathology, characterized as a «saccular» deformity, generally at the level of the fossa ovale, which protrudes to the right or left atrium or both. This entity is strongly associated to cardioembolic events as well as other acquired and congenital heart diseases.

Material and Methods: Over a six and one half year period we have prospectively studied clinically and echocardiographically (including transesophageal echocardiogram (TEE) in 200 (40%) patients), 500 consecutive adults from a total of 22,224 patients (pts) with the diagnosis of ASA.

Results: We found a prevalence of 2.2%, a mean age of 65 yr. , 317 (63%) women and 183 (37%) men. Clinical associations included, HTN 64%, pulmonary HTN 36%, cerebrovascular events (CVE) 23%, Diabetes 23%, heart failure 16%, atrial arrhythmias 13%, COPD 7%, and chronic renal failure 5%. Echocardiographically: valvular abnormality 86% vs 14% without, left ventricular hypertrophy 44%, PFO 36% (40/110), LA enlargement (LAE) 31%, valvular prolapse 13%, RAE 11%, LVE 10%, RVE 8%, atrial septal defect 7 %, vegetations 2.4%, and thrombi 1.2%. The types of ASA were: 1R 16%, 2L 31%, 3RL 12%, 4LR 33%, and type 5, 8% (according to our previously published ASA classification). Mobile ASA 54%, fixed ASA 46%. Left bulging predominance 69% vs 31% right bulging predominance. Type 5 was excluded. Interesting data were found when we analyzed and compared variables like age, gender, type of ASA as well as other concomitant heart diseases. In pts with pulmonary HTN, predominantly left bulging ASA were 114 (69%) vs 52 (31%)* right bulging; COPD 27 (84%) vs 5 (16%)*. In pts with atrial septal defect, predominantly right bulging, 25 (78%) vs 9 (22%)*, while patent foramen ovale pts had left bulging 28 (80%) vs 7 (20%)* of right bulging. (* p <0.05).

Conclusions: This study supports the commonality in identifying ASA by transthoracic as well as transesophageal echocardiogram. Its definitive association with acquired as well as congenital heart diseases, but also as an isolated and totally asymptomatic entity. Its frequent correlation with cerebrovascular embolic events. It is more prevalent in female, left atrial bulging types of ASA, and a tendency towards the mobile types of ASA.

Introduction

Atrial Septal Aneurysm (ASA) is a localized «saccular» deformity of the interatrial septum (IAS), generally at the level of the fossa ovale, which bulges into the right or left atrium or both. ASA was initially thought to be a rare congenital abnormality, however, with the advent of two-dimensional echocardiography and more recently, the widespread use of transesophageal echocardiography (TEE) it has become more easily and more frequently identified in patients.

Prevalence. The prevalence of ASA varies, but transthoracic echocardiographic (TTE) studies estimate the rate to be between 0.08% and 1.2%. In a large autopsy series the prevalence reported was 1%. More recent studies using TEE have demonstrated a prevalence between 2% and 10%. In the pediatric patient population the prevalence reported by TTE is 0.9% to 1.7% in children and 4.9% in infants.

ASA association. Atrial septal aneurysm has been associated with congenital heart diseases such as patent foramen ovale (PFO), atrial septal defects (ASD), ventricular septal defects (VSD), valvular prolapse (VP), patent ductus arteriosus (PDA), Ebstein's anomaly, and tricuspid and pulmonary atresia as well as acquired heart diseases including valvular disease, cardiomyopathy, systemic and pulmonary

hypertension, ischemic heart disease, arrhythmias and thrombus formation. More recently a number of studies found an association between ASA and cerebrovascular events (CVE) of embolic origin, including transient ischemic attacks (TIA) and cerebrovascular accidents (CVA).

Objectives

The main objective of this study is to analyze and correlate the clinical and echocardiographic characteristics of patients with this, everyday more diagnosed, cardiac abnormality.

Material and Methods

During the period of January 1991 and June 1997, we studied 22,224 patients which were referred for transthoracic echocardiography. Of these, 500 patients fulfilled the echocardiographic criteria for atrial septal aneurysm.

Echocardiographic examination. The echocardiographic studies were performed using three commercially available ultrasound systems (Acuson 128, Acuson 128 XP/10c, and Hewlett-Packard sonos 500) with 2.5 to 4 MHz phased array imaging transducers. All systems were capable of both Doppler color and spectral flow. All patients underwent standard TTE views including parasternal long axis, short axis, apical five, four, three, and two chamber views as well as subcostal four chamber and short axis views. The studies were performed with the patient in supine and left lateral decubitus positions during quiet respiration. Particular attention was given to subcostal views with appropriate transducer angulation to visualize the heart completely.

In four chamber view and the interatrial septum with its foramen ovale segment in particular. The atria, including the atrioventricular valves, was magnified to ease the visualization of movement and measurement of the ASA. Patients were placed in the supine position with legs and knees flexed. They were in quiet respiration and sustained inspiration.

Transesophageal echocardiogram was performed in 200 patients with prior TTE studies and who had a diagnosis or suspicion of ASA. All of them had additional indications such as rule-out source of embolism, masses or thrombus, intracavitary shunts, vegetations, etc. TEE was performed after administration of oropharyngeal anesthesia with lidocaine (10%) or aerosolized benzocaine (14%), and occasionally diazepam for sedation. The studies were performed using an Acuson 128 and Acuson 128 XP/10c ultrasound system, with 5-7 MHz single or bi-plane TEE probes. Standard TEE views were obtained.

Contrast study. Contrast studies were performed during the TEE in patients in whom intracavitary shunt was suspected.

Criteria for atrial septal aneurysm. The diagnostic criteria for ASA was made if a saculation or deformity in the interatrial septum or the foramen ovale region was seen. An excursion of = 10 mm into the right or left atrium or if the sum of bilateral excursions of > 10 mm was required. The minimal aneurysmal base amplitude (width) accepted in this study was 15 mm in diameter. The aneurysm was observed in subcostal view, apical four chamber, and parasternal short axis views at the level of the great vessels. Sometimes the bulging was also seen in apical two and three chamber views. The classification of ASA was made according to its different movements, as in previous classifications and regardless of its possibly different etiology. All measurements done in this study were made according to the recommendations of the American Society of Echocardiography. All the studies were taped and hard copies were taken for further analysis and measurements. All cases were reviewed by three different observers.

Statistical analysis. The data were analyzed with Student's *t* test and chi-square test and are given as mean +- standard deviation. A *p* value <0.05 was considered significant.

Results

We found an ASA prevalence of 2.2% (500 ASA in 22,224 patients studied in our laboratory during a period of 6 + years. The mean age was 65 yrs. A predominance in women with 317 Pts. (63%). Table 1.

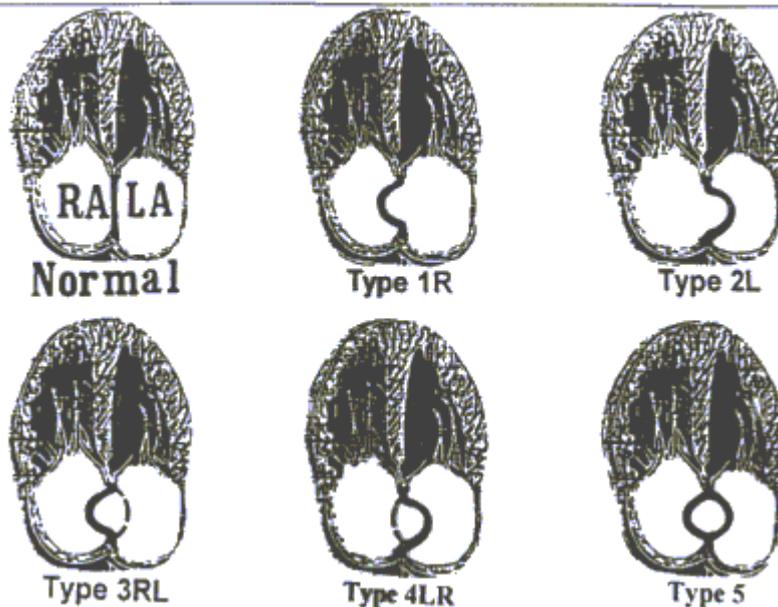
Atrial Septal Aneurysm in 500 Adult Patients

Demographic, Clinical, and Echocardiographic Highlights

- **TOTAL PATIENTS:** 22,234. **Total ASA = 500.** **Prevalence = 2.2 %**
- **GENDER:** **Female= 317 Pt. (63%).** **Male= 183 Pt. (37%).** **Ratio = 1.7: 1**
Range (21-97 years). **Mean Age = 65 years**
- **AGE:**
Patients < 65 yrs = 227 (45%). **Patients ≥ 65 yrs =273 (55)**
- **LEFT VENTRICULAR FUNCTION:** **EF ≥ 50 = 418 Pt. (84%).**
EF < 50 = 82 Pt. (16%).
EF < 30 = 30 Pt. (6%). **Patients with DOM = 23 (5%).**

All patients with ASA were studied and classified in one of five types of ASA, according to a new classification previously published by us. Figure 1 describes the new classification, while Figure 2 shows the numbers and percentages of patients with the different types of ASA. Patients with left bulging predominance represented the majority with a 64% of the total population and a 69% if compared with the predominantly right bulging type of ASA.

NEW CLASSIFICATION OF ATRIAL SEPTAL ANEURYSM



New Classification of Atrial Septal Aneurysm:

TYPE 1R: The ASA protrudes from the midline of the atrial septum to the right atrium throughout the cardiorespiratory cycle.

TYPE 2L: The ASA protrudes from the midline of the atrial septum to the left atrium throughout the cardiorespiratory cycle.

TYPE 3RL: The maximal excursion of the ASA is toward the right atrium with a lesser excursion toward the left atrium.

TYPE 4LR: The maximal excursion of the ASA is toward the left atrium with a lesser excursion toward the right atrium.
TYPE 5: The ASA movement is bidirectional and equidistant to the right as well as to the left atrium during the cardiorespiratory cycle.

Figure 1. Echocardiographic four-chamber view, as well as the different bulgings of the atrial septum with aneurysm, showing the new classification of atrial septal aneurysm and how normally the atrial septum is seen in a two-dimensional depiction.

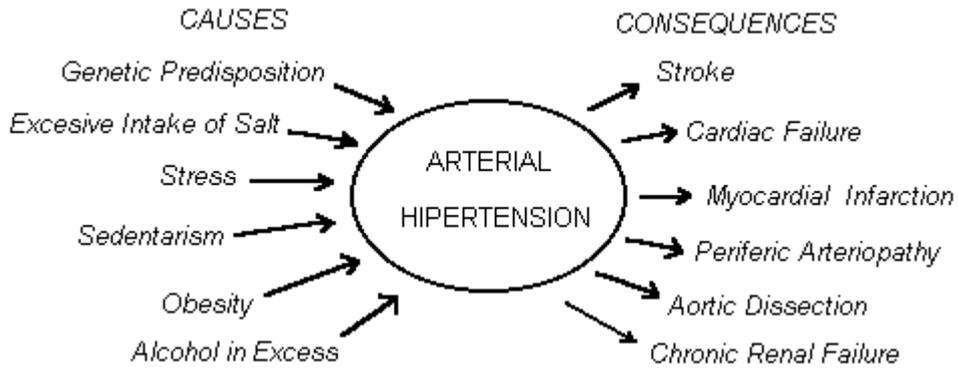


Figure 2

In this study we also analyzed the mobility of the ASA, and we divide them into 2 groups: the «fixed» ASA (types 1R and 2L, which only bulge within an atrium) 231 Pts. (46%), and the «mobile» ASA (types 3RL, 4LR, and Type-5, which bulge bidirectionally into both atria), 269 Pts. (54%), Figure 3.

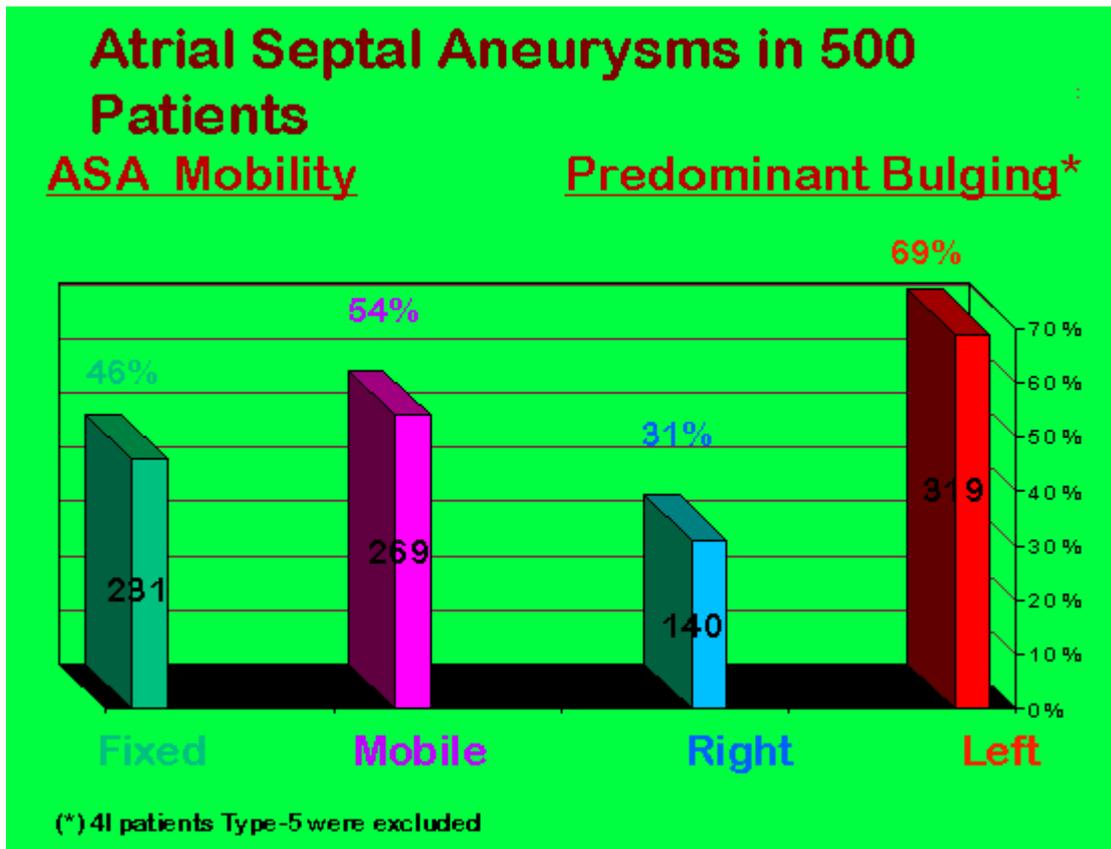


Figure 3

Clinical and echocardiographic variables are described in Table 2.

ATRIAL SEPTAL ANEURYSM IN 500 ADULTS

CLINICAL VARIABLES:		No.	(%)
Number of patients (pts)		500	(100)
Hypertension (HTN)		322	(64)
Pulmonary Hypertension (PHTN)		179	(36)
Coronary Artery Disease (CAD)		170	(34)
Diabetes Mellitus (DM)		113	(23)
Cerebrovascular Events (CVE)		117	(23)
Supraventricular Tachyarrhythmias (SVTA)		63	(13)
Chronic Obstructive Pulmonary Disease (COPD)		36	(7)
Chronic Renal Failure (CRF)		24	(5)
ECHOCARDIOGRAPHIC VARIABLES:			
Total patients with Valvulopathies (VHD)		429	(86)
Ejection Fraction (EF) $\geq 50\%$	418 (84)	82	(16)
Ejection Fraction (EF) $< 50\%$			
Tricuspid Regurgitation (TR)		307	(61)
Left Ventricular Hypertrophy (LVH)		219	(44)
Mitral Regurgitation (MR)		204	(41)
Calcified Aortic Sclerosis (CAS)		200	(40)
Patent Foramen Ovale (PFO)	40/110		(36)
Left Atrial Enlargement (LAE)		154	(31)
Mitral Annular Calcification (MAC)		134	(27)
Aortic Regurgitation (AR)		120	(24)
Mitral and Aortic Calcification (MAC+CAS)		113	(23)
Right Atrial Enlargement (RAE)		83	(17)
Total patients without Valvulopathies		74	(15)
Valvular Prolapse (VP)		66	(13)
Left Ventricular Enlargement (LVE)		48	(10)
Right Ventricular Enlargement (RVE)		38	(8)
Atrial Septal Defect (ASD)		35	(7)
Dilated Cardiomyopathy (DCM)		23	(5)
Aortic Stenosis (AS)		17	(3)
Vegetations (VEG)		12	(2)
Valvular Replacement (VR)		7	(1)
Thrombus (Thr)		6	(1)
Ventricular Septal Defect (VSD)		6	(1)
Eustachian Valve (EV) [prominent]		4	(0.8)
Mitral Stenosis (MS)		3	(.6)

A highlight of these variables are represented in Figure 4. In patients with pulmonary HTN, predominantly left bulging ASA were 114 (69%) vs 52 (31%)* right bulging; COPD 27 (84%) vs 5 (16%)*; PFO 28 (80%) vs 7 (20%)*. In the other hand, patients with ASD had predominantly right bulging in 25 (78%) vs 9 (22%)* of left bulging. (* $p < 0.05$).

Clinical and Echocardiographic Variables

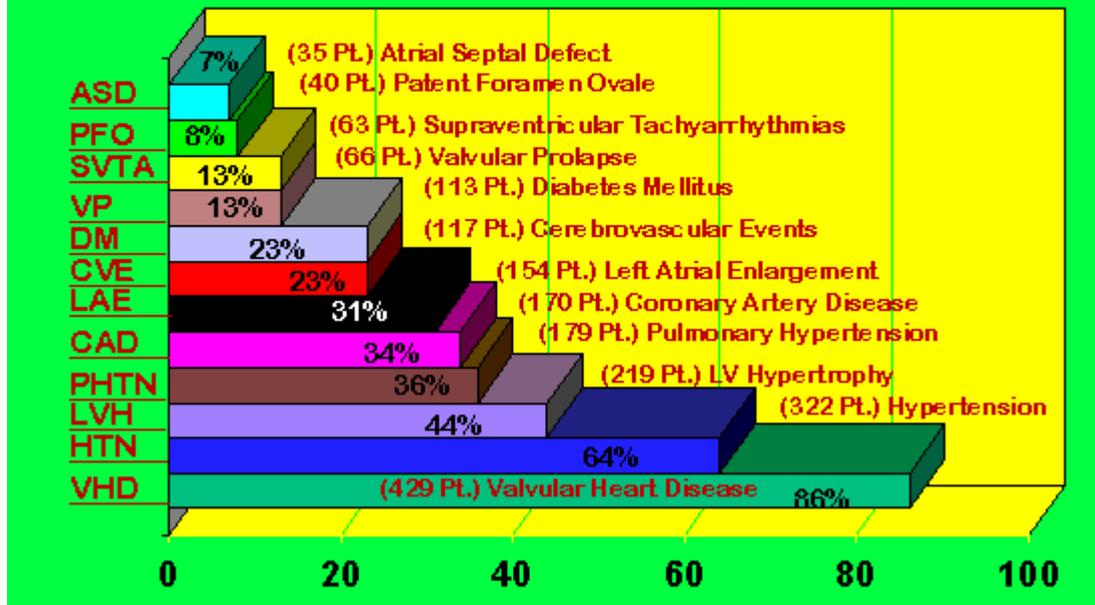


Figure 4

Discussion

ASA is becoming more prominent in clinical cardiology. Its association with cardiac abnormalities, in particular cardiogenic embolic events, contributes to its significance. Only about 100 cases of ASA had been reported before 1985; however, in the last 10 years, and because of new and better 2D echo machines and TEE, a considerable number of cases has been published. To date, this is the largest casuistic study of patients with ASA. The association of ASA with clinical variables like CVE, HTN, CAD, DM, valvular prolapses, arrhythmias, valvulopathies, PFO, ASD, etc., is identified in this large group of patients like can be observed in Table 2.

An Echo with an ASA type 1R is represented in Figure 5. This is an amplified 4C subcostal view of a 65 yr old lady with history of CHF and moderate mitral regurgitation.

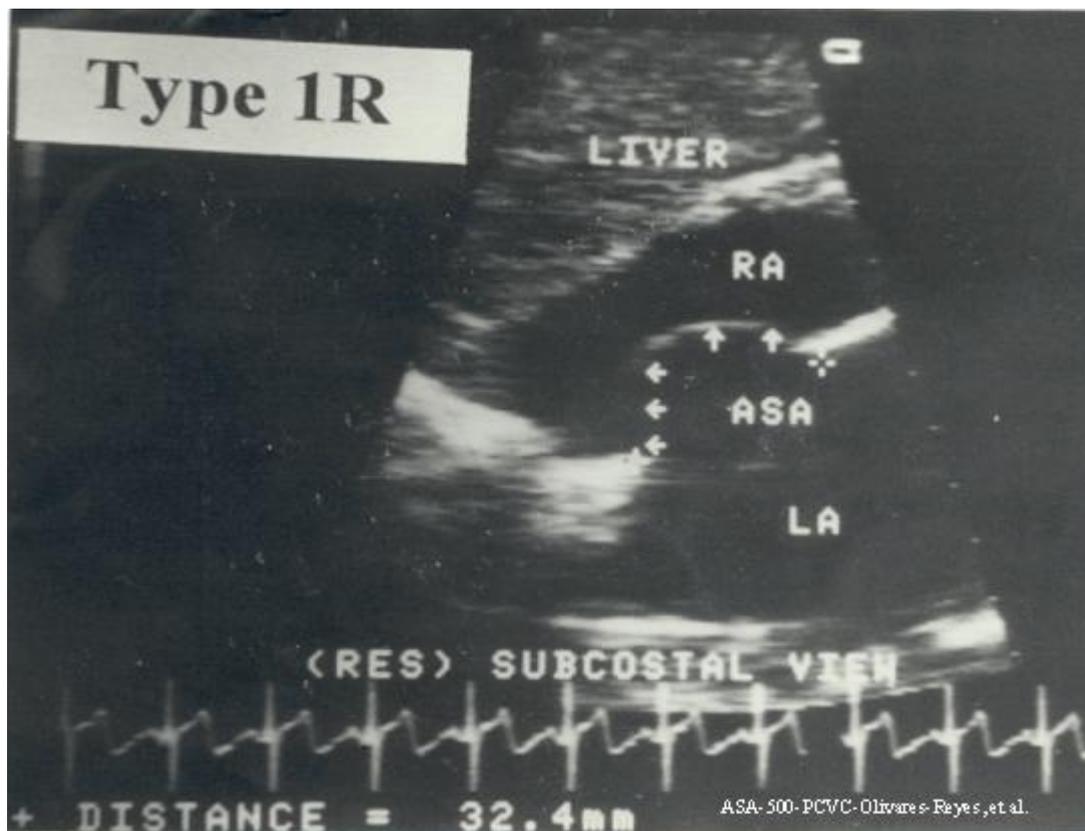


Figure 5

Conclusions

From this study we can conclude: 1) the commonality in identifying ASA by TTE and TEE, 2) Its association with acquired as well as congenital heart diseases, 3) that there is a group of patients with isolated and asymptomatic ASA, 4) Its frequent association to stroke, 5) the left predominance type and mobile ASA., and 6) the tendency to be more frequent in female patients.

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