

The Enigma of Bulging to the Left—A Case Report of An Unusual Atrial Septal Aneurysm

James Ker*

Department of Physiology, University of Pretoria, PO Box 24318, Gesina, Pretoria, South Africa

Abstract

An atrial septal aneurysm (ASA) can be defined as a localized segment of the interatrial septum that bulges into either (or both of) the right or left atrium. It is still not certain whether this is a congenital or an acquired lesion and the natural history is unknown.

An ASA can occasionally be found in association with various disturbances of intracardiac hemodynamics, thus raising the question of a cause effect relationship.

Marazanof et al. found that in 90% of cases the atrial septal aneurysm protruded into the right atrium and that in half of the 10% of cases where it bulged into the left atrium this could not be explained by a raised right atrial pressure. To date this phenomenon remains unexplained.

In this case report such an unusual presentation of an atrial septal aneurysm is presented and discussed.

Keywords: Atrium; Septal; Aneurysm

Introduction

An atrial septal aneurysm (ASA) can be defined as a localized segment of the interatrial septum that bulges into either (or both of) the right or left atrium [1]. It is still not certain whether this is a congenital or an acquired lesion and the natural history is unknown [2].

Furthermore, an ASA can be an isolated lesion or it can be associated with a variety of other cardiac anomalies, such as a patent foramen ovale, atrial septal defect and mitral valve prolapse [1,3-6].

Of even more importance is the fact that an ASA can occasionally be found in association with various disturbances of intracardiac hemodynamics, thus raising the question of a cause effect relationship [2]. An ASA has been reported in association with the following alterations of intracardiac hemodynamics: tricuspid atresia [7,8], premature closure of the foramen ovale [2], mitral stenosis [9], hypoplastic right heart syndrome [10], spontaneous closure of an atrial septal defect [11], severe aortic stenosis in a 68 year old man [9], in a 4 year old boy undergoing revision of a Waterston shunt [9] and even in a case of pulmonary tuberculosis with pulmonary hypertension [2].

Marazanof et al. [12] studied the echocardiographic characteristics of atrial septal aneurysms in 259 patients. They found that in 90% of cases the atrial septal aneurysm protruded into the right atrium and that in half of the 10% of cases where it bulged into the left atrium this could not be explained by a raised right atrial pressure [12]. To date this phenomenon remains unexplained.

In this case report such an unusual presentation of an atrial septal aneurysm is presented and discussed.

Case Report

A 51 year old Caucasian male presented for a cardiovascular examination. He was asymptomatic with no prior surgical or medical problems. He did not use any prescription medication, never smoked and had no known allergies. The reason for the presentation for a cardiovascular examination was the presence of a midsystolic click, auscultated by his primary care provider.

Clinical examination confirmed the presence of a midsystolic click,

no murmur was present. No other abnormalities were detectable. Transthoracic, two dimensional echocardiography revealed the cause of the midsystolic click to be a prominent atrial septal aneurysm (Figures 1-3).

Note the absence of the aneurysm during ventricular diastole with the mitral valve at maximal opening (Figure 4). Figure 1-3 demonstrate



Figure 1: Title: Atrial septal aneurysm during early ventricular systole. Description: Transthoracic echocardiographic image. Note the atrial septal aneurysm bulging into the left atrium early in ventricular systole. Sequential images will show the prolapse to become more pronounced.

***Corresponding author:** Prof. James Ker MRCP, Ph.D, FESC, FACC, Department of Physiology, University of Pretoria, PO Box 24318, Gesina, Pretoria, 0031 South Africa, Tel: +2712-3430078; Fax: +2712-3430079; E-mail: jker@wol.co.za

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the progressive bulge of the interatrial septum into the left atrium as ventricular systole progresses. No other cardiac anomalies were detectable.

Due to the peculiarity that the interatrial septum bulged into the left atrium a comprehensive investigation to rule out any possible cause for pulmonary hypertension was done. A chest radiograph, arterial blood gas analysis, flow-volume loop and ventilation perfusion scintigraph were all within normal limits.

No medical or surgical intervention was done and the patient remains well after 12 months of the initial examination.

Discussion

An atrial septal aneurysm is a known cause of a midsystolic click [13]. Alexander et al. [13] used phonocardiography to show that the click coincides with the sudden bulging of the interatrial septum. As shown in this case the bulging of the interatrial septum is maximal during midventricular systole (Figures 1-4), coinciding with the audible midsystolic click.

Tei et al. [14] have shown that even in normal individuals slight shifts of the interatrial septum can be observed echocardiographically and that these interatrial septal shifts can be greatly exaggerated in the setting of a large interatrial pressure gradient as can be found in mitral stenosis, mitral regurgitation and tricuspid regurgitation.

Pressure changes inside the atria are characterized by the “a, c and v” waves on the atrial pressure curve [15]. In the atrial pressure curve the “a” wave is caused by atrial contraction and ordinarily the right atrial pressure rises to 4-6 mmHg and the left atrial pressure to about 7-8 mmHg during atrial contraction [15]. The “c” wave occurs when the ventricles begin to contract and is caused mainly by the bulging of the atrioventricular valves backward into the atria [15]. The “v” wave occurs at the end of ventricular contraction and is the result of blood flowing into the atria while the atrioventricular valves are still closed [15]. In the normal individual left atrial pressure exceeds right atrial pressure, so why then the bulging into the left atrium? This phenomenon was already noted by Marazanof et al. [12] in 1995, but remains unexplained. In that study 259 cases of atrial septal aneurysms

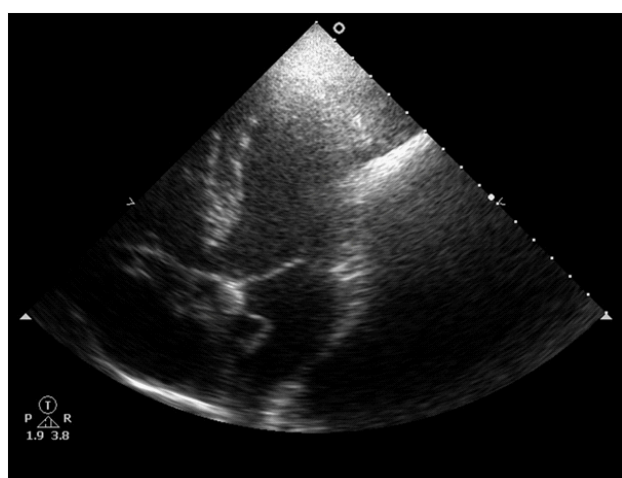


Figure 2: Title: Atrial septal aneurysm during mid ventricular systole.
Description: Transthoracic echocardiographic image. Note the more pronounced bulging of the atrial septal aneurysm into the left atrium as ventricular systole progresses.

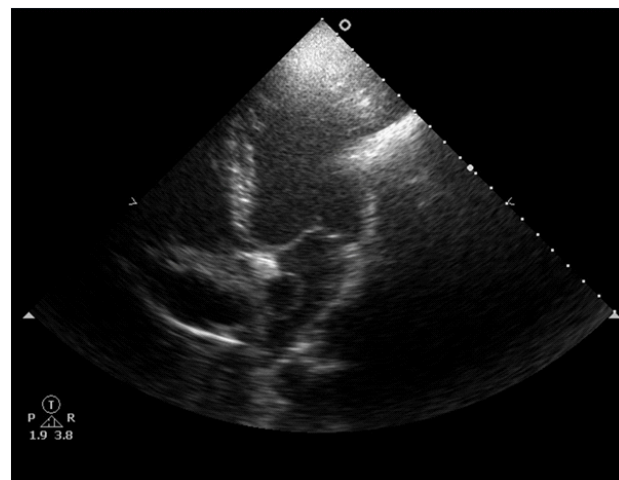


Figure 3: Title: Atrial septal aneurysm during late ventricular systole.
Description: Transthoracic echocardiographic image. Note the maximal bulge into the left atrium during late ventricular systole.



Figure 4: Title: Atrial septum during ventricular diastole
Description: The atrial septum during ventricular diastole. Note that there is no bulging of the septum into the left atrium.

were studied and 90% of these protruded into the right atrium. As in this case half of the 10% of cases where the aneurysm protruded into the left atrium the phenomenon could not be explained by an increased right atrial pressure [12].

In the same study by Marazanof et al. [12] it was noted that in all patients the fossa ovalis was involved in the aneurysm, but that in 55% of cases the aneurysm extended to the distal two thirds of the interatrial septum, thus creating a similar thin and outpouching membrane. Currently, no data on the genetical aspects of interatrial septal aneurysms are available. There is a possibility that this entity may be the result of an abnormality of connective tissue or a congenital abnormality of interatrial septation [12].

These are important questions to answer as an interatrial septal aneurysm may be a major cause of ischemic stroke in young adults [16] with recent reports suggesting that an atrial septal aneurysm associated with a patent foramen ovale might be a common cause of stroke even in patients older than 55 years [17,18]. An atrial septal aneurysm frequently co-exists with an atrial septal defect and/or a patent foramen

ovale [19] and this combination of lesions is more strongly associated with cryptogenic stroke and also more likely to lead to recurrent stroke than a patent foramen ovale in isolation [20,21].

Previous dogma held that stroke risk was due to paradoxical embolism through a patent foramen ovale, yet this risk remains undefined as deep venous thrombosis is infrequently detected in such patients [19]. An alternative and currently plausible mechanism for systemic embolism in these patients entails the presence of left atrial dysfunction and intermittent atrial arrhythmias, such as atrial fibrillation [19,22,23]. The incidence of atrial fibrillation in patients with atrial septal aneurysm ranges from 0% to 23% [5,24,25].

In conclusion, it is suggested that there are many aspects of atrial septal aneurysms still to be elucidated and specifically that the stroke risk may be more related to atrial arrhythmia than currently realized. It can be hypothesized that atrial septal aneurysms bulging into the left atrium may be more prone to systemic embolism purely due to the left atrial bulge.

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