Secundum atrial septal defect and pulmonary hypertension in an 86-year-old woman: a case report and review of the literature

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A case of well tolerated secundum atrial septal defect in a woman who died at 86 years of age is described and the lesions responsible for pulmonary hypertension are discussed. Previous reports of over-70-year-old patients with untreated secundum atrial septal defect are also reviewed.

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Introduction

Secundum atrial septal defect (ASD) is the most frequently diagnosed congenital heart malformation in adults. The life expectancy of patients with an unrepaired defect does not exceed 50 years[1,2]. Arrhythmias, in particular atrial fibrillation, are a major complication of the disease and often lead to congestive heart failure. The surgical treatment of the defect carries a low risk at any age but, according to a recent retrospective study by Oakley[3], over the age of 25 years surgery fails to prevent atrial arrhythmias and thromboembolism. At present, there are no prognostic studies which deal with the short- and long-term outcomes of patients who have been subjected to device closure of the defect.

The increased pulmonary blood flow may, after many years, eventually lead to the development of pulmonary hypertension which usually manifests in middle-aged patients[4]. Many different pathogenetic factors which may give rise to pulmonary vascular remodeling have been considered: an increase in the left-to-right shunt due to progressive enlargement of the ASD, individual congenital hyperreactivity of the vascular endothelium, failure of the pulmonary vascular resistance to fall sufficiently after birth, thrombotic and/or thromboembolic lesions, recurrent pulmonary infections, left ventricular dysfunction due to systemic hypertension, mitral valve disease, and coronary artery disease. However, it is not currently possible to establish which patient, and at what age, is liable to develop hypertensive lung disease[2].

A few cases of secundum ASD over the age of 70 have been reported in the literature (13 cases from 70 to 79 years, 12 cases over 80 years) (Table I)[5-19]. In the elderly, the clinical and pathologic features are similar to those found in younger patients, but the malformation is often misdiagnosed owing to its frequent association with coronary artery disease and/or systemic hypertension. Atrial fibrillation is common because of progressive dilation of the right atrium, while pulmonary hypertension has rarely been observed[8]. A few case reports regarding patients who were completely free from cardiac symptoms have been described[14,18].

Case report

An 84-year-old woman was admitted following a severe episode of dyspnea with peripheral edema. On physical examination there was cardiac arrhythmia with an increased intensity of the pulmonary component of the second heart sound. The electrocardiogram disclosed atrial fibrillation/flutter and right bundle branch block. A grade 3 systolic murmur was detected at the lower left sternal border. A two-dimensional echocardiogram showed right atrial and ventricular enlargement, the ventricular free wall measuring about 11 mm in thickness. In addition, color Doppler imaging revealed tricuspid insufficiency with an estimated pulmonary arterial systolic pressure of 87 mmHg. These findings were confirmed by a transesophageal echocardiogram which clearly disclosed an ostium secundum ASD with a left-to-right shunt.

Table I. Cases of secundum atrial septal defect over the age of 70 reported in the literature.

Author	Age (years)	Sex	ECG	Pulmonary hypertension
Tinney[5], 1940	76	M	Nodal rhythm	–
Rosenthal[6], 1956	81	F	Atrial arrhythmias	–
Colmers[7], 1958 (2 cases)	72	M	AF + incomplete RBBB	–
	78	M	AF + incomplete RBBB	–
Rodstein et al.[8], 1961	72	F	Afl + RBBB	–
Fisher et al.[9], 1962	80	F	Incomplete RBBB	No
Zaver and Nadas[10], 1965 (2 cases)	90	–	–	–
	96	–	–	–
Nasrallah et al.[11], 1976 (2 cases)	72	F	Sinus rhythm	No
	76	F	AF	No
St John Sutton et al.[12], 1981 (2 cases)	82	F	–	Yes
	83	F	–	–
Trivellato et al.[13], 1983 (3 cases)	72	F	RBBB + AV block	No
	73	M	AF + incomplete RBBB	No
	78	F	Incomplete RBBB	No
Perloff[14], 1984 (2 cases)	87	F	AF + RBBB	Yes
	94	M	AF + incomplete RBBB + LAF block	–
Ueda[15], 1984 (2 cases)	91	F	–	–
	93	F	–	–
Landi et al.[16], 1991 (3 cases)	75	F	AF/Afl + RBBB	Yes
	76	M	RBBB + AV block	Yes
	87	F	Sinus rhythm + incomplete RBBB	–
Murakami et al.[17], 1996	79	M	AF	Yes
Nomura et al.[18], 1996	90	M	Sinus rhythm + incomplete RBBB	No
Zueger et al.[19], 1997	70	M	AF	No
Present case	86	F	AF + RBBB	Yes

AF = atrial fibrillation; Afl = atrial flutter; AV = atrioventricular; LAF = left anterior fascicular; RBBB = right bundle branch block.

After discharge, the patient was treated with warfarin, digitalis and diuretics, and her general conditions improved. She was readmitted 18 months later for hematemesis and severe dyspnea requiring mechanical ventilation. On physical examination, the patient was mentally confused and there was evidence of peripheral edema and cyanosis. Her blood pressure was 90-95/70 mmHg and the heart rate 110 b/min. Three weeks later she was discharged on her previous therapeutic regimen consisting of warfarin, digitalis and diuretics. After 6 months, she was again referred to hospital following a transient ischemic attack. Chest X-ray revealed prominent main right and left pulmonary arteries with peripheral "cut-off", aortosclerosis, and marked right atrial and ventricular enlargement (Fig. 1). At Doppler evaluation the pulmonary arterial systolic pressure was approximately 100 mmHg. Two days after admission, at the age of 86 years, the patient died during sleep.

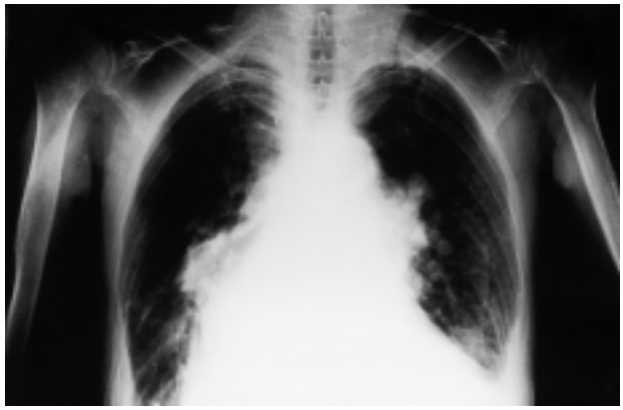

Figure 1. *Chest X-ray showing marked enlargement of the right atrium and ventricle and prominent main pulmonary arteries with abrupt tapering of the peripheral arteries.*

At *postmortem* examination, the heart was spherical in shape and weighed 505 g. A 2 × 1.5 cm ASD was found in the region of the fossa ovalis, which measured 5 × 4 cm (Fig. 2). The right atrium, tricuspid annulus and right ventricle appeared markedly dilated. The right ventricular wall was severely hypertrophic and the interventricular septum showed a straight configuration. The coronary arteries were widely patent. The pulmonary trunk was about twice the diameter of the aorta and patchy intimal fibrolipidic thickening was evident. Macroscopic findings also included mild pulmonary edema and a cirrhotic liver (930 g). No focal lesions were found in the brain.

Histologic examination of the lung disclosed several plexiform lesions of different age, concentric intimal cellular proliferation and/or fibrosis causing severe narrowing of the lumen of many arterioles, arteriolar thickening and hyalinization and old thrombotic lesions with channels of recanalization (Fig. 3). Other pulmonary

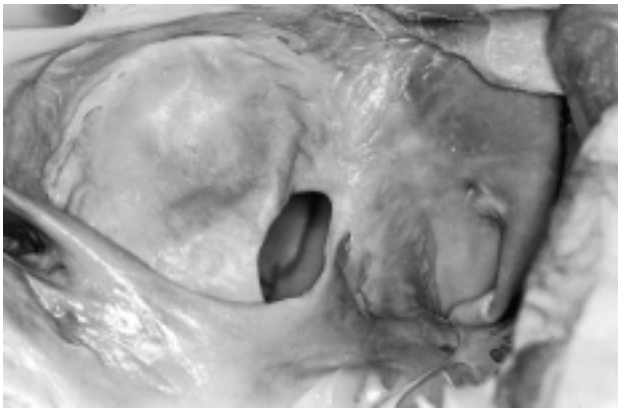

Figure 2. *Secundum atrial septal defect viewed from the right atrium.*

findings were intra-alveolar hemorrhage with iron-laden macrophages, cholesterol granulomas, lymphoid aggregates and thin vascular channels within scattered foci of fibrosis. The pulmonary trunk presented an adult-type elastic pattern.

Discussion

In our case, secundum ASD was well tolerated until the age of 84 years when the patient gradually developed signs and symptoms of right heart failure. Congestive gastropathy was probably the cause of hematemesis favored by anticoagulation, while either a sharp drop in the cerebral blood flow or paradoxical embolism could explain the transient ischemic attack occurring 2 days before death. The insignificance of the atheromatous lesions in the coronary bed, the absence of systemic hypertension, the late onset of atrial fibrillation and pulmonary hypertension were certainly instrumental in the patient's long survival.

Pathologic findings in the lung, all probably contributing to the final picture of pulmonary hypertension, deserve special mention. Plexiform lesions of varying age and widespread concentric intimal cellular proliferation and fibrosis of the muscular arteries and arterioles were the striking features consequent to the long-standing increased pulmonary blood flow through the large ASD. Thrombotic lesions were also numerous and were related either to primary thrombosis or to recurrent thromboembolism. Wagenvoort and Mulder[20] have focused attention on the fact that arterial thrombi and their sequelae (i.e. eccentric intimal fibrosis, recanalization) may complicate any form of pulmonary hypertension and the patient's age would appear to be a major factor in the development of these lesions. These authors have suggested that persistent endothelial injury induced by an increased flow and/or pressure in the lung circulation might facilitate thrombosis in an adult. In the present case, another pathogenic mechanism could be taken into account, that is to say the slowing down of the circulation in heart failure. Moreover, in addition to primary thrombi, even thromboem-

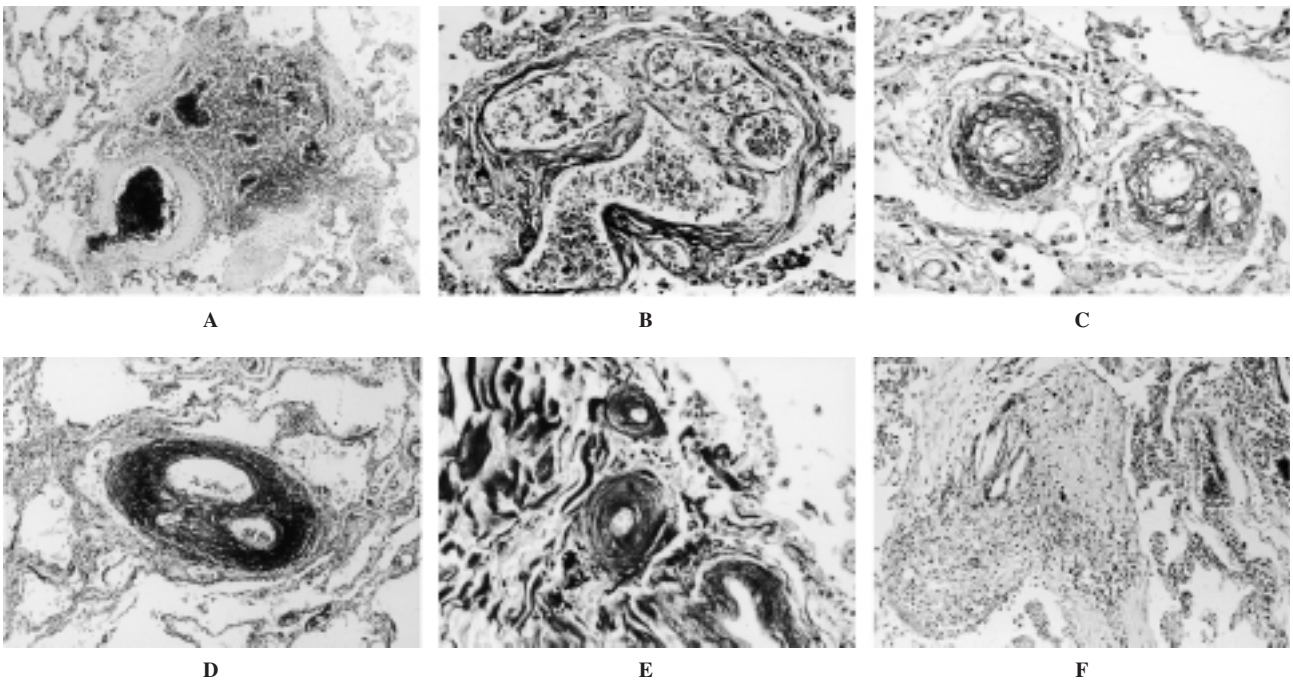

Figure 3. *Pathologic findings in the lung:* A) *an angiomatoid lesion with numerous vascular channels of capillary size (hematoxylin-eosin ×50);* B) *a plexiform lesion with various vascular channels in a large pouch (Masson's trichrome ×350);* C) *concentric intimal cellular proliferation and fibrosis in arterioles (Elastic van Gieson ×350);* D) *organization and revascularization of a thrombotic lesion (Masson's trichrome ×50);* E) *age-related vascular lesions: thickening and hyalinization of arterioles (Masson's trichrome ×350);* F) *a fibrotic area in which some cholesterol clefts can be seen (hematoxylin-eosin ×150).*

boli as a consequence of atrial fibrillation could have contributed to the occlusion of the muscular arteries and arterioles.

Besides vascular restructuring of the lung, primarily fibrotic and dilatative in type, parenchymal lesions, mostly consisting of granulomas with cholesterol clefts and areas of mature fibrosis, were easily identified. Their origin from foci of intrapulmonary hemorrhage was supported by the presence of numerous iron-laden macrophages in these zones[21].

Our case represents an uncommon example in which a secundum ASD was compatible with good health, a long survival and with a late onset of atrial fibrillation and pulmonary hypertension. If atrial fibrillation is the rule in the natural history of secundum ASD, pulmonary hypertension is rare with, however, a higher prevalence in older patients. An array of factors was certainly responsible for the progressive rise in arterial lung pressure: an increased blood flow, thrombi and/or thromboemboli, age-related vascular changes, and numerous chronic parenchymal lesions.

The diagnosis of a secundum ASD in the elderly can be difficult because of concomitant cardiac and non-cardiac pathologies. With the increase in life expectancy, the common event of atrial fibrillation or fibrillo/flutter in old people should also suggest the possibility of an unrecognized secundum ASD, the frequency of which might be higher than is commonly thought.

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