Patent Ductus Arteriosus with Combined Valvular Disease at Age 91

Tadashi SATOH, Yoshihiro YANAGITANI* and Yoshiaki OKANO*

This report describes a 91-year-old patient with patent ductus arteriosus (PDA) complicated by combined valvular disease (CVD) (aortic and mitral stenosis, and aortic, mitral, pulmonic and tricuspid regurgitation). This patient seems to be the oldest living female with PDA and CVD hitherto reported in the medical literature. The patient developed several bouts of congestive heart failure which were treated medically. She not only has survived without surgical management, but is still enjoying her life at age 91. The features of PDA in the elderly are reviewed.

Key words: continuous murmur, patent ductus arteriosus in the aged, left-to-right shunt

Introduction

Patent ductus arteriosus (PDA) is rarely found in the elderly (1). Patients with combined valvular disease (CVD) also suffer a fatal outcome due to progressive deterioration of ventricular dysfunction. The oldest age for PDA in the literature was an 80-year-old female in Japan (2) and a 90-year-old male in the USA (3). To the best of our knowledge, this patient represents the oldest patient with newly diagnosed PDA with CVD reported in the literature.

Case Report

On October 21, 1982, a 77-year-old Japanese female (S.K.) was first admitted to the National Cardiovascular Center, Osaka, Japan because of dyspnea on exertion and edema. The patient had been well until 3 days earlier, when “tightness” developed in the chest followed by palpitation and orthopnea. She, however, had neither fever nor hemoptysis.

The patient was born in 1905, the 4th female of 6 female children by normal delivery. There was no known history of rubella during her mother’s early pregnancy. She married at age 21, and spent an active life as a housewife and delivered one son at age 36. When she applied for her life insurance at age 60, however, she was informed for the first time that she had cardiac murmurs on auscultation. At age 65 (1970) she consulted Satoh Medical Clinic, Toyonaka, Osaka, Japan for a routine physical examination and was diagnosed with CVD and was treated accordingly thereafter.

There was no known family history of congenital heart disease in her relatives including her siblings. She denied any past history of frequent throat infections, rheumatic fever, collagen disease or infectious endocarditis. The diagnosis of PDA and CVD (aortic and mitral stenosis, and aortic, mitral, pulmonic and tricuspid regurgitation) were made by noninvasive studies, together with clinical findings. She was discharged in good condition on December 2, 1982.

Recent physical examination and laboratory data (August 1996) were as follows. The patient was thin, small and kyphotic. Her height was 140 cm and her weight was 35 kg. The temperature was 36.7°C. The blood pressure was 160/84 mmHg, and the pulse was 72 beats/min. The cardiac examination revealed marked cardiomegaly, a grade 3 continuous murmur best heard at the 2nd intercostal space along the sternal border, and grade 3 systolic and diastolic murmurs at the apex and near the left sternal border (Fig. 1).

A chest roentgenogram showed enlargement of the left atrium and left ventricle (CTR = 0.8), calcified aortic arch and prominent pulmonary trunk with increased pulmonary vascular marking (Fig. 2). An electrocardiogram revealed atrial fibrillation and left ventricular hypertrophy (Fig. 3).

A cardiac ultrasonogram with Doppler technique showed spectral flow pattern from the descending aorta to the main pulmonary artery via PDA and continuous wave Doppler flow within the ductus was recorded (Fig. 4). The aortic valve showed increased echogenicity and slightly reduced mobility. The thickened mitral valve orifice was slightly reduced with mild regurgitation (MR). The aortic stenosis (AS) was mild with a pressure gradient of 55 mmHg. The aortic regurgitation (AR) was mild. The pulmonic (PR) and tricuspid regurgitation...
(TR) were moderate with pulmonary artery systolic pressure of 60 mmHg. Echocardiographic measurements and values were as follows: Left atrial dimension was 46 mm, interventricular thickness 11 mm, left ventricular internal dimension at end diastole 53 mm, left ventricular internal dimension at end systole 34 mm, left ventricular ejection fraction 0.65 and fractional shortening of left ventricle 0.35. Cardiac catheterization was not performed because of her age.

Urine was normal, hematocrit 32%, white cell count, 7,400 per cubic millimeter, and platelet count 365,000 per cubic millimeter; mean corpuscular volume was 85 μm³, prothrombin and partial-prothrombin times were normal. Serum values for aspartate aminotransferase, urea nitrogen, creatinine, bilirubin, electrolytes and alkaline phosphatase were all within normal limits.

Figure 2. Chest X-ray demonstrated an enlarged left ventricle occupying the apex with a dilated pulmonary trunk. Aortic knuckle was calcified.
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Figure 3. ECG illustrated atrial fibrillation and ventricular hypertrophy.

Discussion

PDA is the third most common congenital cardiovascular anomaly, comprising approximately 10% of those or about 1 or 2 in 3,000 live births (4). The oldest known male patient with PDA lived to the age of 90 years in the USA (3); the oldest female patient lived to the age of 80 years in Japan (2). These reports demonstrate that PDA is compatible with survival to an old age, but the natural history of PDA much more commonly involves substantial morbidity and mortality in early to midlife. Hemodynamically significant adult PDA has typically been associated with inexorable cardiovascular derangement, including congestive heart failure, infectious endocarditis, and pulmonary hypertension (5). The average age of death being 35 to 40 years with only occasional patients surviving past 50. Campbell found that 34% of PDA patients died before the age of 40 and 61% before the age of 60 (1). In Japan, 5 PDA patients over 60 years of age have been reported and all were female (2). In a large series of 804 patients with PDA seen in

Figure 4. Continuous wave Doppler flow within the ductus was recorded from the parasternal short-axis view. Flow above the baseline indicated flow from the aorta to the main pulmonary artery (upper recording). Color flow image of the parasternal short-axis view at the base demonstrated the ductal flow from the descending aorta (DA) to the main pulmonary artery (MPA) (lower). AO: aorta.
Edinburgh, 37 reached 50 years of age. Investigators found that atrial fibrillation, advanced left ventricular hypertrophy, and marked cardiomegaly were common in those elderly patients, regardless of the ductus size (5).

We gathered information on PDA patients who lived ≥75 years of age reported between 1951 and 1996 for easier assessment by Roberts (6) (Table 1).

The mean age of the patients was 83 years; 7 were women and 1 was a man. The female to male ratio was high; it reflects the tendency for women with PDA to survive longer than men with PDA. Of the 8 patients, 1 underwent operative closure of the PDA and the oldest age of closure was 72 years. Of the 8 patients, 3 underwent cardiac catheterization.

The physiologic consequences of PDA depend chiefly upon the size of the communication, the pulmonary vascular resistance and the functional capability of the volume-loaded left ventricle (4). The determination of pulmonary (Qp) to systemic (QS) blood flow is the principal means of quantitating the size of the cardiac shunt (7–11). A recent echocardiogram revealed that the extent of the shunt in the present patient was mild to moderate with a pulmonary systolic pressure of 60 mmHg (12, 13).

The findings of chest X-ray, ECG, and echocardiogram from October 1982 (first hospitalization) to August 1996 are presented (Table 2). The degrees of AR, AS, MR, and MS at the first admission (1982) were similar to those in August 1996. The valvular involvement was compatible with senile arteriosclerotic degeneration (14, 15). There was neither rheumatic valvulitis nor congenitally bicuspid valve. The degrees of PR and TR increased to grade 2/4 and 3/4, respectively, in August 1996. Development of PR and TR was due to dilatation of the valve ring and annulus as a consequence of pulmonary hypertension and right ventricular overload (16, 17).

Since her admission to the hospital, her congestive heart failure has been controlled well with administration of digoxin, furosemide, spironolactone, and transdermal nitroglycerin (18). She is also treated with 5 gm sodium diet consisting mainly of fish and fresh vegetables and oxygen inhalation at home (19).

### Table 1. Eight Patients with PDA ≥75 Years of Age Reported from 1951 to 1996

<table>
<thead>
<tr>
<th>Author (Year)</th>
<th>Age/Sex</th>
<th>Pulmonary Artery (s/d)</th>
<th>References</th>
</tr>
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<tbody>
<tr>
<td>Fishman (1951)</td>
<td>75/F</td>
<td>–</td>
<td>Am Heart J 41: 762, 1951.</td>
</tr>
<tr>
<td>Present case (1997)</td>
<td>91/F</td>
<td>–</td>
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F: female, M: male, s: systolic pressure, d: diastolic pressure.

### Table 2. Findings of Chest X-ray, ECG, and Echocardiogram (1982–1996)

<table>
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<tr>
<td></td>
<td></td>
<td>66%</td>
<td>69%</td>
<td>76%</td>
<td>80%</td>
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<tr>
<td>ECG</td>
<td>AF, LVH</td>
<td>AF, LVH</td>
<td>AF, LVH</td>
<td></td>
<td></td>
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<tr>
<td>Aortic regurgitation (grade)</td>
<td>1/4</td>
<td>1/4</td>
<td>1/4</td>
<td>1/4</td>
<td></td>
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<tr>
<td>Aortic stenosis (grade)</td>
<td>mild</td>
<td>mild</td>
<td>mild</td>
<td>mild</td>
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<tr>
<td>Mitral regurgitation (grade)</td>
<td>1/4 (MVP)</td>
<td>1/4</td>
<td>1/4</td>
<td>1/4</td>
<td></td>
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<tr>
<td>Mitral stenosis (grade)</td>
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<td>mild</td>
<td>mild</td>
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<td></td>
</tr>
<tr>
<td>Pulmonic regurgitation (grade)</td>
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<td>1/4</td>
<td>2/4</td>
<td>2/4</td>
<td></td>
</tr>
<tr>
<td>Tricuspid regurgitation (grade)</td>
<td>1/4</td>
<td>1/4</td>
<td>1/4</td>
<td>3/4</td>
<td></td>
</tr>
<tr>
<td>PA systolic pressure (mmHg)</td>
<td>20</td>
<td>30</td>
<td>42</td>
<td>60</td>
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</table>

Even though the patient has such a serious cardiac handicap and high risk with PDA and CVD, medical management including the strict adherence to medication and her life style, particularly her dietary habits, have all contributed significantly to her longevity.

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References