ACUTE AORTIC REGURGITATION WITH CONGESTIVE HEART
FAILURE DUE TO BACTERIAL ENDOCARDITIS:
DIAGNOSED BY ECHOCARDIOGRAM
AND TREATED SUCCESSFULLY BY SURGERY
A CASE REPORT

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RECENTLY we encountered a patient with acute severe aortic regurgitation as diagnosed by echocardiography and which was then confirmed surgically. His moribund life was saved by aortic valve replacement.

CASE REPORT

A 23-year-old Japanese male had been in good health until October 1975, when he developed headache, chills, sore throat and nasal discharge. Nasal discharge and sore throat gradually subsided but chills, severe non-productive cough and an elevated temperature of 39°C persisted. After the above symptoms showed some improvement, he went back to his previous work, but soon noticed shortness of breath when climbing stairs. On December 27, 1975 after he came home from his office, he again noted chills, fever to 39°C, anorexia and a general lassitude which was more severe than usual. Laboratory examination revealed an ASLO of 625 T.U. In January, 1976, aortic regurgitant murmur was first recognized. A positive blood culture for *Staphylococcus epidermidis* was obtained in one of three arterial blood

specimens. There had been no embolic signs and no history of dental manipulation. In spite of the antibiotic therapy, there was no clinical improvement and he was referred to Kyoto University Hospital on April 13, 1976.

Physical examination on admission revealed a pale young man whose temperature was 37°C, pulse 100 per minute and regular, blood pressure 140/0 mmHg at the right arm, 112/0 at the left, slight bobbing of the head was present with pistol shot sounds over the carotid and femoral arteries. Capillary pulsation was apparent. Moist râle was heard over the lung bases. A forceful ventricular heave was present with an apical impulse 4 cm lateral to the left mid-clavicular line. The heart sound was regular. There were a decreased first heart sound, an accentuated aortic 2nd sound, and a prominent 3rd heart sound on auscultation. A Levine's grade 4 diastolic high-pitched murmur was maximal at 4LSB, a grade 3/6 diastolic rumbling murmur maximal at the apex, and a grade 3/6 medium-pitched early systolic murmur maximal at 4 LSB. The liver was palpable 6 cm below the right costal margin and was slightly tender. The spleen was slightly enlarged. Pretibial edema was practically absent. Laboratory studies on admission showed: Hct 38%, Hb 13 gm/dl, RBCC 442×10^4 WBCC 7,000 with 64% neutrophils, LDH 198 u., S-GOT 38 u., S-GPT 13 u., BUN 11 mg/dl, Uric Acid 6.1 mg/

Key Words:

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Fig.1-A.

Fig.1-B.

Fig.1. Progressive cardiac enlargement and increased pulmonary vasculature are evident. (A) In Fig.1-B, marked enlargement of the left ventricle and left atrium can be seen.

dl, Na 143 mEq/L, K 4.1 mEq/L, Cl 107 mEq/L, Cholesterol 101 mg/dl, Fasting Blood Sugar 77 mg/dl, Total Plasma Protein 6.7 mg/dl, A/G 1.73, ASLO 166 u., CRP (—), RA test (—), TPHA (—), and ESR 4.5 mm.

Serial chest X-rays are shown in Fig. 1, progressive cardiac enlargement and increased pulmonary vasculature were evident. In particular the cardio-thoracic ratio enlarged from 0.50 to 0.64 from January 7, 1976 to May 24, 1976. In Fig. 1-B, marked enlargement of the left ventricle and left atrium is noted.

In Fig. 2, serial electrocardiographic changes are shown. There is remarkable LVH, but no ST depression and T wave change in the ECG of January 17, 1976. However, in the ECG of May 29, 1976 more remarkable LVH, ST depression in V_5-V_6 , inverted T wave change in V_5-V_6 , and poor R wave progression are evident (In Fig. 2, V_4 , V_5 , and V_6 are all recorded with half standard, and V_1 , V_2 , and V_3 are recorded with half standard in the ECG of April 29 and May 29. All other leads are recorded with one standard).

The echocardiogram is shown in Fig. 3. In Fig. 3-A, the arrow shows the snowfall-like aortic cusp echoes in systole. In Fig. 3-B-a, the arrow shows premature mitral valve closure. In Fig. 3-B-b, the arrow head indicates shaggy, and

thickened aortic cusp echoes and the arrow does an eccentric aortic cuspid in distole. Echocardiogram in Fig. 3-A was recorded on January 9, 1976, Echocardiogram in Fig. 3-B was recorded on April 20, 1976. There was no "a" wave in the apex cardiogram. Therapy with digoxin (0.25 mg) and trichlormethiazide (2 mg) was initiated. Serial blood cultures were obtained before ingestion of antibiotics but pathogenic bacteria were not detected.

From April 25, 1976 he became orthopneic with facial edema and trichlormethiazide was increased to 4 mg per day. A temporary improvement followed. From May 28, 1976 an oral antibiotic (cephalexin 1.0 g/day) was administered prophylactically. From May 28, 1976 oral facial edema reappeared and epigastralgia with nausea and vomiting developed. There was no evidence of digitalis intoxication and though the antibiotic was discontinued, there were no improvement in gastrointestinal symptoms. On June 1, 1976 he was transferred to the Surgical Department for an aortic valve replacement. On June 7, 1976 Bjork-Shiley valve was successfully implanted. Bacteriological studies of the excised cusp and the vegetation of the valve gave negative results. Hemodynamic measurements were undertaken intraoperatively and postoperatively. Table I shows the results:

Fig.2-A.

Fig.2-B.

Fig.2. Serial electrocardiographic changes are seen. There is remarkable LVH, but no ST depression and T wave change in the ECG of January 17, 1976. However, in the ECG of May 29, 1976 more remarkable LVH, ST depression in V_5-V_6 , and poor R-wave progression are evident. In this figure, V_4 , V_5 , and V_6 are recorded with half standard, and V_1 , V_2 , and V_3 are recorded with half standard only in the ECG of April 29 and May 29. All others are recorded with one standard.

LVEDP at operation was elevated to 45 mmHg, compared with postoperative LVEDP of 13 mmHg. Operative findings of the aortic valve were as follows: 1) The valve was congenitally bicuspid with no commissural fusion and composed of a large posterior left cusp and a smaller anterior right cusp. 2) Both cusps were thin and the soft large, non-calcified masses of vegetation in the left coronary cusp were larger than those in the right one. 3) The cusp was intact and there was no vegetation on the ventricular surface of the cusps. 4) The sinus of Valsalva and the aortic root were also intact.

DISCUSSION

Since antibiotics came into practical usage, the mortality rate of infective endocarditis, especially bacterial endocarditis has been markedly decreased in comparison with that of the pre-

antibiotic era. Septicemia itself can usually be well controlled with antibiotic treatment. However, infective endocarditis complicated by congestive heart failure has remained difficult to treat. Robinson and Ruedy¹ reported that in the pre-antibiotic era, mortality rate of sepsis was 64% and that with congestive heart failure was 12%, but in the post-antibiotic era the mortality rate of sepsis decreased to 15% but that with congestive heart failure increased to 64%. In our patient sepsis was successfully controlled but congestive heart failure failed to respond to intensive treatment with digitalis and diuretics and rapid progression followed. Griffin² reported that lone medical therapy of acute bacterial endocarditis complicated with severe congestive heart failure showed a mortality rate of 88%, but medical therapy combined with surgical procedures reduced the mortality rate significantly

Fig.3-A.

Fig.3-A.

Fig.3-B-a.

Fig.3-B-b.

Fig.3. In Fig.3-A, the arrow shows snowfall-like aortic cusp echoes in systole. In Fig.3-B-a, the arrow shows premature mitral valve closure. In Fig.3-B-b, the arrow head indicates shaggy, and thickened aortic cusp echoes and the arrow an eccentric aortic cusp in distole. Echogram in Fig.3-A was recorded on January 9, 1976. Echogram in Fig.3-B was recorded on April 20, 1976.

TABLE I PRESSURE RECORD IN OPERATION

	<i>m-PA</i>	<i>R V</i>	<i>L V</i>	<i>L A</i>	<i>Rad. A</i>
<i>Preoperation</i>	50/15	50/0	130/45.0	35/5	150/45
<i>Preoperation</i>	41/8	38/1	128/13.0	13/1	118/68

m-PA: main pulmonary artery, *RV*: right ventricle, *LV*: left ventricle, *LA*: left atrium, *Rad. A*: radial artery

to 20%. It is generally considered that patients in whom a heart failure never developed have a better prognosis; patients who developed heart failure not easily controlled should be considered as candidates for immediate aortic valve replacement even when the endocarditis has not been satisfactorily controlled. "Mild" heart failure patients may be victims of a sudden death due to serious arrhythmias from embolic myocarditis or infarction. These patients should be carefully monitored and early operation should be seriously considered when there is an advent of arrhythmias or evidence of peripheral embolization. In our patient, staphylococcus epidermidis was cultured only once from the multiple blood specimens, and it was not clear whether this organism was the pathogen related to this disorder. However, echocardiography presented strong evidence that acute severe aortic regurgitation resulted from valvular involvement together with the subacute bacterial endocarditis. DeMaria et al.³ reported that distinctive, thickened, irregular aortic leaflet echoes with normal systolic excursion and mitral preclosure with anterior leaflet fluttering enabled the diagnosis of acute aortic regurgitation due to endocarditis, even in the absence of a positive blood cultures. In the echocardiogram on January 9, 1976, premature mitral valve closure was not evident, but careful observations indicated snowfall-like echo on the aortic cusps only in systole.

The appearance of premature mitral valve closure without tachycardia and obvious snowfall-like echoes on the aortic cusps on April 20, 1976 indicate the progression of aortic regurgitation due to increased vegetations. Marked eccentricity of aortic valvular diastolic echoes were a hallmark of a congenital bicuspid aortic valve,⁴ an eccentricity index (EI) of 1.3 in the absence of an associated ventricular septal defect was diagnostic of a bicuspid aortic valve and could be expected to be found in an approximately three-quarters of all subjects with this abnormality.⁵ As many as 25% of patients with a bicuspid aortic valve have been known to develop bacterial endo-

carditis.⁶ In addition, valvular vegetations on echocardiogram were a hallmark of endocarditis and that they looked like masses of shaggy echo creating an irregular thickening of valves.⁷ The features of aortic reflux with respect to the mitral echogram are premature closure of the mitral valve and such has been reported particularly in severe aortic regurgitation of the anterior cusp.^{8,9} These reports indicate that congenital aortic bicuspid valve is usually involved in bacterial infection and this critically ill states can be found out by the use of non-invasive echocardiography.

Wigle and Labrosse¹⁰ reported 14 patients with severe aortic insufficiency in whom an extremely elevated left ventricular end-diastolic pressure exceeded left atrial pressure during diastole. In our case, LVEDP measured during operation was elevated to 45 mmHg. This case illustrates one of the most serious cardiac complications of bacterial endocarditis which developed on the basis of bicuspid aortic valve. Bicuspid aortic valve is rather an uncommon anomaly in Japan. Echocardiography was essentially the sole diagnostic procedure to attain a precise anatomical and pathological diagnosis in this case, and it should be emphasized that cardiac catheterization was not undertaken as such may well be hazardous in some of these critical ill patients. Surgical procedure with aortic valve replacement was successfully performed without undue delay resulting in satisfactory control of bacterial endocarditis and aortic regurgitation. In a recent paper, a similar case was reported by Kasahara et al.¹¹ but premature mitral valve closure was not reported in their patient.

SUMMARY

A 23-year-old Japanese male with no evidence of previous heart disease was presented with bicuspid aortic valve and a life threatening acute aortic regurgitation due to subacute bacterial endocarditis. By echocardiographic techniques, a precise diagnosis was made based on the following findings: 1) premature mitral valve closure, 2)

snowfall-like echoes between the systolic aortic cusps, 3) eccentricity of a diastolic aortic valvular echo. The echocardiographic diagnosis was confirmed on surgery, in which aortic valve replacement was performed with satisfactory postoperative results.

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