J Cardiol 2005 Jun; 45(6): 257–262

Successfully Treated Triple Valve Infective Endocarditis: A Case Report

Kenichi SAKAKURA, MD
Norifumi KUBO, MD
Takuji KATAYAMA, MD
Tomio UMEMOTO, MD
Satoshi OOSAWA, MD*
Seiichiro MURATA, MD*
Yoshitaka SUGAWARA, MD
Hiroshi FUNAYAMA, MD
Yousuke TAKAGI, MD
Takanori YASU, MD, FJCC
Yoshio TSURUYA, MD
Takashi INO, MD*
Muneyasu SAITO, MD, FJCC

Abstract

A 45-year-old woman presented with triple valve infective endocarditis and ventricular septal defect. There were vegetations on the tricuspid valve, pulmonary valve, and aortic valve. She had multiple complications such as nephrotic syndrome, severe anemia, congestive heart failure, and convulsion. Her general condition was extremely poor. Intensive medical therapy, such as blood transfusion, mechanical ventilation, and continuous venovenous hemofiltration, allowed her to tolerate surgery. Triple valve replacement and ventricular septal defect closure was successfully performed without major complication. She was ambulatory at the time of discharge.

J Cardiol 2005 Jun; 45(6): 257–262

Key Words

■**Endocarditis (infective)** ■**Tricuspid valve (triple valve replacement)**

INTRODUCTION

Infective endocarditis usually invades one or two valves. We present a case of triple valve infective endocarditis causing vegetations on the tricuspid, pulmonary, and aortic valves, associated with complications such as nephrotic syndrome, severe anemia, and congestive heart failure, which was treated successfully.

CASE REPORT

A 45-year-old woman became aware of leg and facial edema in February 2003, and dyspnea on exertion in March 2003. Her medical history was unremarkable except for a ventricular septal defect (VSD) first identified at the age of 26 years. She had undergone no dental procedures. She was admitted to a local hospital because of congestive heart failure. Although diuretics (furosemide and

自治医科大学附属大宮医療センター総合医学Ⅰ 循環器科，*心臓血管外科：〒330−8503 さいたま市大宮区天沼町1−847
The Cardiovascular Division, The First Department of Integrated Medicine, *Department of Cardiovascular Surgery, Omiya Medical Center, Jichi Medical School, Saitama
Address for correspondence: KUBO N, MD, The Cardiovascular Division, The First Department of Integrated Medicine, Omiya Medical Center, Jichi Medical School, Amanuma 1−847, Omiya, Saitama 330−8503; E-mail: kubonori@omiya.jichi.ac.jp
Manuscript received September 17, 2004; revised November 16, 2004; accepted November 16, 2004

Table 1 Laboratory data on admission

WBC	14,470/μl	Cr	2.13 mg/dl
RBC	198×10⁴/μl	T-Cho	169 mg/dl
Hb	5.6 g/dl	Na	139 mEq/l
Ht	17.1%	K	3.6 mEq/l
Plt	24.1×10⁴/μl	Cl	105 mEq/l
T-P	5.7 g/dl	GLU	113 mg/dl
ALB	2.1 g/dl	CRP	8.26 mg/dl
T-BIL	0.35 mg/dl	PT	13.3 sec
GOT	17 IU/l	APTT	47.6 sec
GPT	10 IU/l	AT-3	72%
LDH	352 IU/l	Fibrinogen	302 mg/dl
CPK	34 IU/l	FDP	80.7 μg/ml
BUN	47 mg/dl		

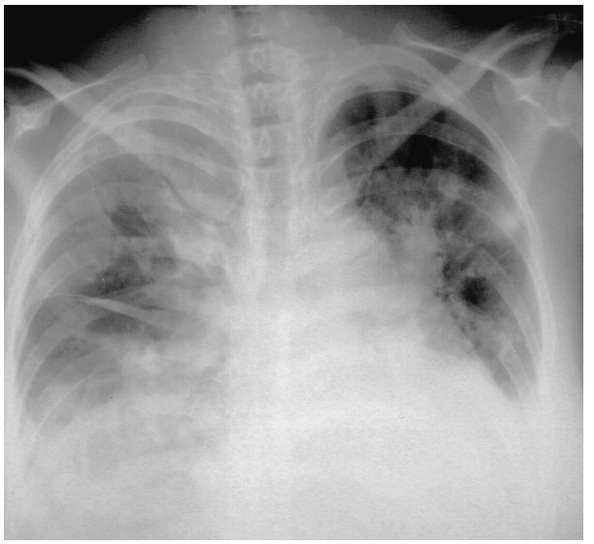

Fig. 1 Chest radiograph on admission showing cardiomegaly, pulmonary congestion, and bilateral massive pleural effusion

spironolactone) were administered, her medical condition did not improve. Echocardiography revealed a vegetation on the tricuspid valve. She was referred to our medical center on March 29, 2003.

The patient was 161 cm tall and weighed 69 kg. Her blood pressure was 160/90 mmHg, heart rate was 106 beats/min, and body temperature was 37.3 ℃. Her general status indicated severe systemic edema. Her palpebral conjunctiva was anemic. She had remarkable decay of the teeth. A grade 4/6 pan-systolic murmur was audible at the second left sternal border and breath sounds were diminished. Her abdomen was severely distended. A complete blood count revealed increased white blood cells and decreased hemoglobin concentration. Blood chemistry revealed hypoalbuminemia (albumin), and renal dysfunction (blood urea nitrogen; creatinine) (**Table 1**). Urinalysis revealed proteinuria (+++) and occult blood (+++). Chest radiography showed cardiomegaly, pulmonary congestion, and bilateral massive pleural effusion (**Fig. 1**).

Echocardiography demonstrated a VSD (perimembranous defect) and vegetations on the pulmonary and aortic valves as well as the tricuspid valve (**Fig. 2**). A large vegetation spanned the VSD and the tricuspid valve. M-mode measurements revealed that the left ventricular dimensions at enddiastole and endsystole were 62 and 47 mm, respectively. Doppler imaging revealed moderate aortic regurgitation and moderate tricuspid regurgitation, but the VSD jet was not clearly delineated. The transtricuspid pressure gradient was 45 mmHg. The inferior vena cava was not dilated.

Our initial diagnosis was infective endocarditis, nephrotic syndrome, anemia, and congestive heart failure. Since her general status was too poor for surgery, we began intensive medical therapy. Antibiotics (penicillin G, 24 million units/day and gentamicine sulfate, 60 mg/day) were initiated for infective endocarditis. Albumin concentrate and furosemide were administered for severe edema due to nephrotic syndrome. Blood transfusions were also given for severe anemia. During the antibiotic therapy, blood cultures were examined six times, but all failed to yield bacteria. As the inflammation progressed, other antibiotics (vancomysin and fulconazole) were added.

She suddenly suffered convulsions on April 3, 2003. Following the convulsions, conjugate deviation to the left, anisocoria, and left hemiparesis occurred. She was intubated and emergent brain computed tomography was performed (**Fig. 3**). Computed tomography found no signs of hemorrhage, or infarction. Her level of consciousness improved and conjugate deviation, anisocoria, and hemiparesis disappeared. Magnetic resonance imaging was performed 2 weeks later also excluded infarction (**Fig. 4**).

Although she recovered spontaneous respiration, she was placed on a respirator for 6 days because of hypoxia due to congestive heart failure. Large amounts of albumin concentrate and furosemide

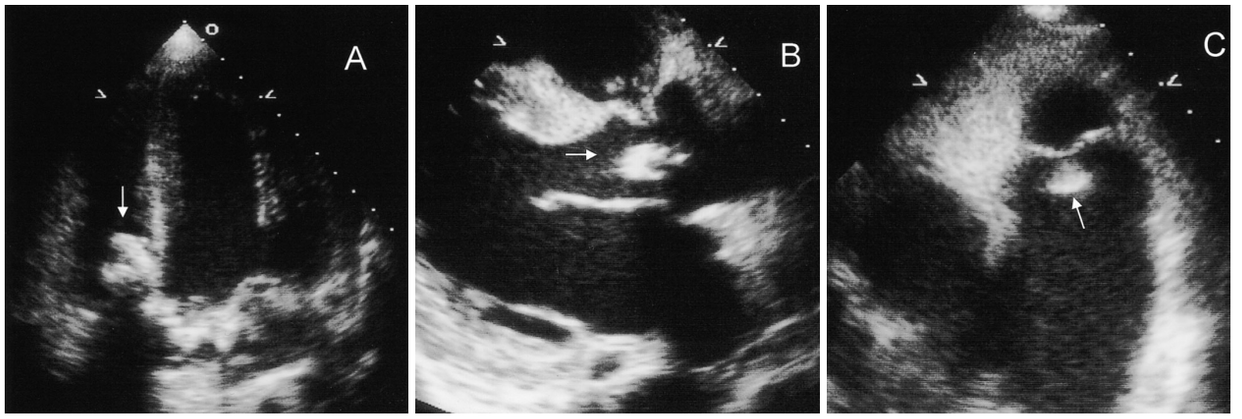

Fig. 2 Transthoracic echocardiograms demonstrating vegetations (*arrows*) on the tricuspid valve (*A*), aortic valve (*B*), and pulmonary valve (*C*)

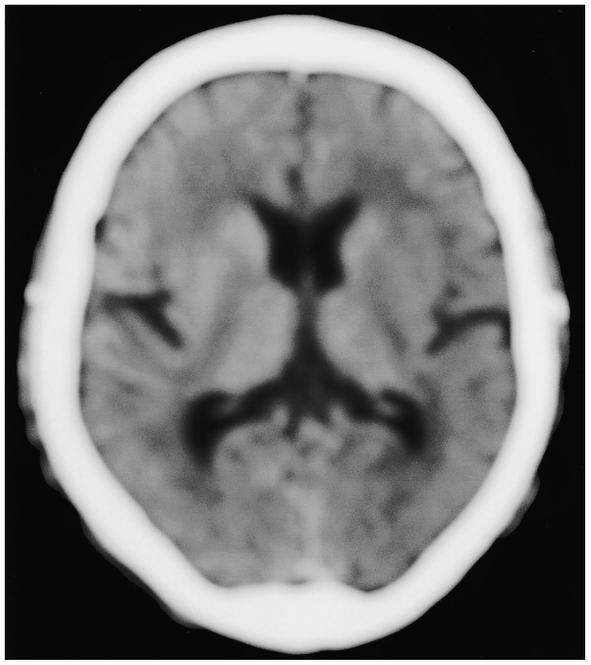

Fig. 3 Brain computed tomography scan just after convulsion showing no signs of infarction or hemorrhage

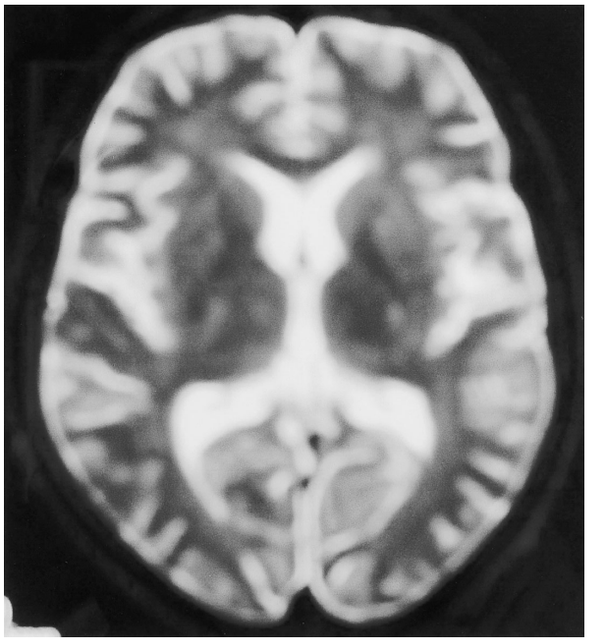

Fig. 4 T_2-weighted brain magnetic resonance image showing no signs of infarction or hemorrhage

were administered intravenously, but her massive edema could not be controlled. Continuous venovenous hemofiltration (CVVH) was initiated, and the massive edema began to disappear. This aggressive medical therapy improved her general status except for the infection. Levels of inflammatory markers still continued to be high despite the administration of many kinds of antibiotics such as penicillin G, gentamicine sulfate, vancomycin, or fulconazole. C-reactive protein level above 10 mg/d*l* persisted. We decided on surgery to control the infection.

Triple valve replacement and VSD closure were performed on April 18, 2003. The operative findings showed that each cusp of the tricuspid valve was covered with vegetations (**Fig. 5**). These tricuspid valve vegetations were connected with the vegetations around the VSD. The non-coronary cusp of the aortic valve had a vegetation. The aortic valve vegetation was not connected with the vegetations around the VSD. The right and anterior

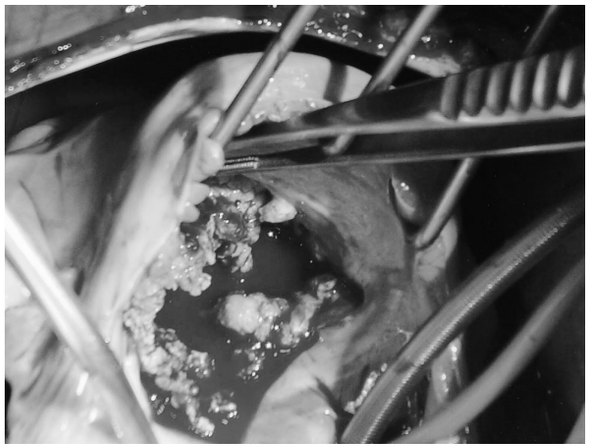

Fig. 5 Intraoperative photograph of the tricuspid valve severely damaged by large vegetations

cusps of the pulmonary valve also had vegetations. There were no signs of infection around the valvular rings or myocardium. The VSD was closed with a pericardial patch. The aortic and pulmonary valves were replaced with 21 mm mechanical valves and the tricuspid valve was replaced with a 29 mm tissue valve.

Histopathological study found severe cellular infiltration with neutrophils in all three valves, as well as calcification. Culture of the vegetations failed to yield any organism. Her general condition began to improve with post-operative medical management. Complete atrioventricular block emerged after the operation, so a permanent pacemaker was implanted on June 6, 2003. She was ambulatory at the time of discharge.

DISCUSSION

This patient presented with triple valve infective endocarditis complicated by nephrotic syndrome, anemia, congestive heart failure, and convulsions. Combined medical and surgical therapy for infective endocarditis can decrease mortality in patients with congestive heart failure, perivalvular invasive disease and uncontrolled infection[1]. However, her initial general status was so poor that surgical therapy could not be tolerated (her body weight was 69 kg on admission and 40 kg on discharge). Hemodynamic status at the time of operation is the major determinant of operative mortality. Thus, we first aimed to improve her general status with aggressive medical therapy for 20 days prior to surgical therapy.

CVVH was begun to treat her massive edema because conservative treatment such as diuretics and albumine concentrate did not ameliorate her edematous condition. CVVH is a very useful modality for critically ill patients, especially with renal failure[2,3]. Although congestive heart failure is a controversial indication for CVVH, this procedure dramatically improved her edematous condition.

She did not receive a regular medical check up, so any causality between endocarditis, nephrotic syndrome and severe anemia is difficult to consider. Before discharge, her creatinine level had normalized (0.65 mg/dl), but proteinuria (+++) and hematuria (+++) were still present. The cause of nephrotic syndrome was difficult to identify without renal biopsy. We suspected glomerulonephritis because she had gross hematuria. The cause of the transient increase of creatinine might be immunoreaction to infective endocarditis, or decrease of renal blood flow due to hypoalbuminemia and congestive heart failure.

Triple valve endocarditis is rare[4–6]. Our patient was critically ill due to multiple severe complications. However, we could improve her condition for surgery with intensive medical treatment, especially with CVVH.

She suffered convulsion with focal symptom on April 3, 2003. Her focal signs disappeared after several hours. Computed tomography on the next day and magnetic resonance imaging 2 weeks later excluded brain infarction. This transient ischemic attack might have been due to septic embolization from endocarditis.

Transthoracic echocardiography is a highly specific and moderately sensitive modality for the diagnosis of infective endocarditis[1,7,8]. Transthoracic echocardiography clearly demonstrated vegetations on the tricuspid, pulmonary, and aortic valves. In our case, VSD might have played a major role in these multiple vegetations (aortic, tricuspid, and pulmonary valves). Congenital heart disease is one of the major risk factors for infective endocarditis[9], and there is an association between infective endocarditis and congenital heart diseases[10,11]. Interestingly, triple valve (tricuspid, mitral, aortic) endocarditis was associated with VSD[4].

Since serial blood cultures were sterile, we could not identify the primary causative organism. Furthermore, we were unable to draw blood before the administration of antibiotics. The histological

study found severe cellular infiltration with neutrophils in all three valves, and calcification which suggested bacterial colonies. However, the histological study did not reveal whether these organisms were cocci or rods. Although we could not detect the causative organism, her decayed teeth were supposed to be the infection sources. Decayed teeth and dental procedures are classical incitant factors, and current studies reveal that these factors are still important in Japan[12,13].

Triple valve replacement and VSD closure were performed. Although we could manage her massive edema and severe anemia, we could not control the infection in spite of multiple strong antibiotics. The main purpose of surgery was infectious control, which was accomplished without major complications. Complete atrioventricular block emerged after the operation. The tricuspid valve was ravaged by large vegetations and removal of these vegetations might have resulted in damage to the atrioventricular conduction system.

Even triple valve infective endocarditis with severe complications can be treated successfully by the replacement of all three valves.

要　　約

三弁に及ぶ感染性心内膜炎の1例

坂倉　建一　　久保　典史　　片山　卓志　　梅本　富士　　大澤　　暁
村田聖一郎　　菅原　養厚　　船山　　大　　高木　洋介　　安　　隆則
鶴谷　善夫　　井野　隆史　　齋藤　宗靖

感染性心内膜炎は，通常，1つもしくは2つの弁を病巣とするが，当センターに紹介された45歳の女性は3つの弁に病巣を持ち，さらに心室中隔欠損も伴っていた．三尖弁，肺動脈弁，大動脈弁にそれぞれ疣贅が認められた．症例はネフローゼ症候群，強度の貧血，うっ血性心不全，痙攣発作と多くの合併症を呈していた．当初は外科的手術が施行できる全身状態ではなかったが，輸血，人工呼吸管理，持続的静脈血液濾過などの集中的内科治療により全身状態の改善がみられたので，三弁同時置換および心室中隔欠損パッチ閉鎖術が計画された．この難手術は大きな合併症もなく，無事成功した．その後，症例は独歩で退院となった．

J Cardiol 2005 Jun; 45(6): 257−262

References

1) Mylonakis E, Calderwood SB: Infective endocarditis in adults. N Engl J Med 2001; **345**: 1318−1330
2) Bellomo R, Farmer M, Boyce N: A prospective study of continuous venovenous hemodiafiltration in critically ill patients with acute renal failure. J Intensive Care Med 1995; **10**: 187−192
3) Bent P, Tan HK, Bellomo R, Buckmaster J, Doolan L, Hart G, Silvester W, Gutteridge G, Matalanis G, Raman J, Rosalion A, Buxton BF: Early and intensive continuous hemofiltration for severe renal failure after cardiac surgery. Ann Thorac Surg 2001; **71**: 832−837
4) Ohyama Y, Nihei T, Kimura K, Yakuwa H, Uchino K, Ishikawa T, Kuji N, Hayashi S, Watanabe Y, Ishii M, Kondo J, Matsumoto A: A case of ventricular septal defect associated with active infective endocarditis which was successfully treated by triple valve replacement and ventricular septal defect patch closure. Kokyu To Junkan 1991; **39**: 1049−1053(in Jpn with Eng abstr)
5) Bortolotti U, Casarotto D, De Mozzi I, Gallucci V, Russo R, Cevese PG: Acute bacterial endocarditis requiring emergency triple valve replacement and pace-maker implant. J Cardiovasc Surg(Torino)1979; **20**: 587−590
6) Rippe JM, Curley F, Paraskos JA, Schoen FJ, Cohn LH, Alpert JS: Triple-valve endocarditis with unusual echocardiographic findings. Am Heart J 1984; **107**: 598−605
7) Bayer AS, Bolger AF, Taubert KA, Wilson W, Steckelberg J, Karchmer AW, Levison M, Chambers HF, Dajani AS, Gewitz MH, Newburger JW, Gerber MA, Shulman ST, Pallasch TJ, Gage TW, Ferrieri P: Diagnosis and management of infective endocarditis and its complications. Circulation 1998; **98**: 2936−2948
8) Prendergast BD: Diagnosis of infective endocarditis. BMJ 2002; **325**: 845−846
9) Niwa K, Nakazawa M, Miyatake K, Tateno S, Yoshinaga M; Japanese Circulation Society(JCS)Joint Working Groups for Guidelines for Management of Infective Endocarditis; Japanese Society of Pediatric Cardiology and Cardiac Surgery Joint Working Groups for Guidelines for Prophylaxix, Diagnosis and Management of Infective Endocarditis in Patients with Congenital Heart Disease: Survey of prophylaxis and management of infective endocarditis in patients with congenital heart disease: Japanese

nationwide survey. Circ J 2003; **67**: 585−591
10) Pekdemir H, Gokhan Cin V, Necdet Akkus M, Doven O: Cyanotic tetralogy of Fallot with its infective endocarditis complication on the tricuspid and pulmonary. Circ J 2004; **68**: 178−180
11) Watanabe Y, Taketani Y, Takei Y, Tanaka K, Watanabe Y: Complete heart block resulting from quadricuspid aortic valve penicillin-resistant pneumococcal endocarditis: A case report. Circ J 2003; **67**: 275−276
12) Nakatani S, Mitsutake K, Hozumi T, Yoshikawa J, Akiyama M, Yoshida K, Ishizuka N, Nakamura K, Taniguchi Y, Yoshioka K, Kawazoe K, Akaishi M, Niwa K, Nakazawa M, Kitamura S, Miyatake K; Committee on Guideline for Prevention and Management of Infective Endocarditis, Japanese Circulation Society: Current characteristics of infective endocarditis in Japan: An analysis of 848 cases in 2000 and 2001. Circ J 2003; **67**: 901−905
13) Ako J, Ikari Y, Hatori M, Hara K, Ouchi Y: Changing spectrum of infective endocarditis: Review of 194 episodes over 20 years. Circ J 2003; **67**: 3−7