

## Infective endocarditis at the tricuspid valve following central venous catheterization

SHU-ICHI YAMASHITA<sup>1</sup>, KENJI NOMA<sup>2</sup>, GO KUWATA<sup>2</sup>, KAHORI MIYOSHI<sup>2</sup>, and KAORU HONAGA<sup>2</sup>

<sup>1</sup>Division of Emergency Medicine, Municipal and County Hospital of Miyazaki Medical Association, 738-1 Funato, Shinbeppu-cho, Miyazaki 880-0834, Japan

<sup>2</sup>Department of Internal Medicine, Municipal and County Hospital of Miyazaki Medical Association, Miyazaki, Japan

### Abstract

We report a case of infective endocarditis at the tricuspid valve attributed to central venous catheterization. The patient was a 35-year-old woman who had multiple septic emboli in her lung due to tricuspid valve endocarditis after successful treatment of bronchiolitis obliterans organizing pneumonia. She also had right ileosacral arthritis. The case was closely related to catheter-associated *Staphylococcus aureus* bacteremia. She was treated with intravenous administration of vancomycin and surgical removal of vegetation and tricuspid valvuloplasty. Since infective endocarditis can be a complication of central venous catheterization with high morbidity and mortality, maximal precautions to minimize the risk, early detection, and appropriate treatment of these complications are mandatory to improve patients' outcome.

**Key words** Pulmonary septic emboli · Tricuspid valve · Right-sided endocarditis · Methicillin-resistant *Staphylococcus aureus* (MRSA) bacteremia

### Introduction

Central venous catheters are inserted for measurement of hemodynamic variables, delivery of nutritional support and medication, and blood-access for blood purification such as hemodialysis and hemofiltration. Despite the fact that the catheterization and its maintenance are common practices, more than 15% of patients who receive central venous catheters have some complications [1,2]. Among those complications, infection in the bloodstream, especially infective endocarditis, causes serious sequelae with high morbidity and mortality. We present here a rare case of catheter-related infective endocarditis, which occurred unusually at a tricuspid valve.

### Clinical report

A 35-year-old woman was admitted to our hospital because of high fever and dyspnea. Her family physician had prescribed anti-gastric ulcer medication with lansoprazol two weeks before her admission. Four days before admission, she had cough and fever. Her condition gradually deteriorated, resulting in severe dyspnea. On admission, our physical examination showed a respiratory rate of 40 beats·min<sup>-1</sup>. Chest X-ray and computed tomographic (CT) scans revealed diffuse bilateral pulmonary infiltrate with airbronchogram (Fig. 1). She was intubated with a tracheal tube, and artificial ventilation using a respirator was immediately started. Her sputum was scarce and showed no bacteria or protozoa. Her condition was too severe for her to receive bronchoalveolar lavage and transbronchial lung biopsy. She was suspected of suffering from bronchiolitis obliterans organizing pneumonia, which might be induced by lansoprazol. We therefore started treatment with methylprednisolone at 1g·day<sup>-1</sup> for 3 days, which was succeeded by 60mg·day<sup>-1</sup> of prednisolone. We also prescribed parenteral ciprofloxacin 600mg·day<sup>-1</sup>; nevertheless, serum cold hemagglutinin and antibodies against *Mycoplasma pneumoniae* and *Chlamydia pneumoniae* were all negative. At first, she was given medication and nutrition through a central venous catheter at the right internal jugular site. On the 7th hospital day, we removed the catheter and inserted a new one at the left subclavian site because of slight redness at the initial insertion site. The patient showed no systemic response to infection. The tip culture was negative. Since her condition was dramatically improved, we started to taper prednisolone. On the 14th hospital day, however, her body temperature reached 39°C again. The physical examination showed no cardiac murmur, including Rivero-Carvalho's sign. There were no signs of infection, such as erythema, tenderness, induration, or purulence within 2cm of the exit site of the catheter. The

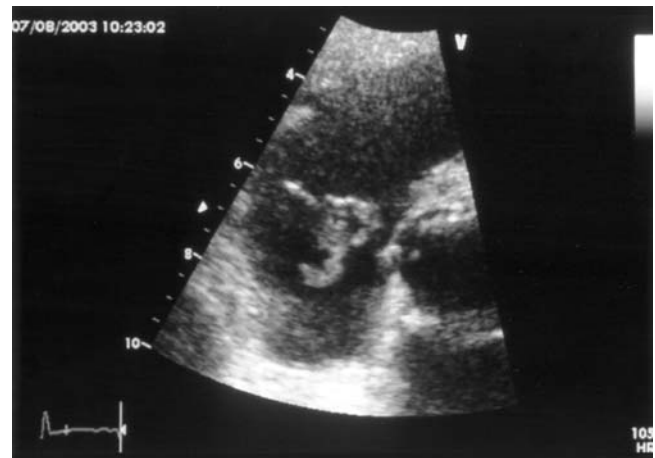


**Fig. 1.** Chest CT scan image of the patient on admission showed diffuse bilateral pulmonary infiltrates with airbronchogram that were compatible with the findings of severe bronchiolitis obliterans organizing pneumonia

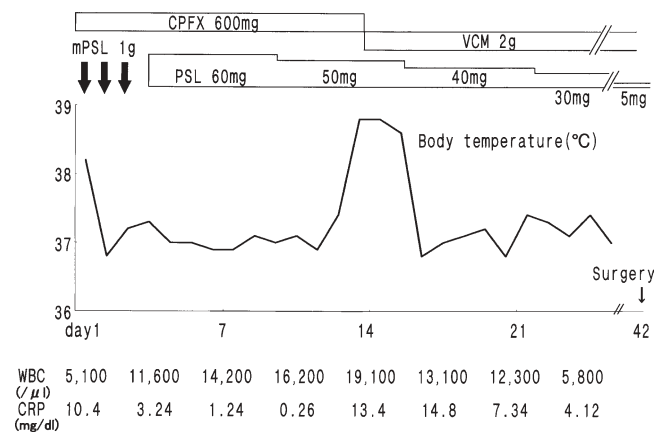


**Fig. 2.** Chest CT scan image of upper lung field of the patient when she had infective endocarditis at her tricuspid valve shows multiple round infiltrates with cavities, which suggests the presence of multiple septic emboli in both lung fields

white blood cell (WBC) count was  $19100 \mu\text{l}^{-1}$  with 89% neutrophils. Chest CT revealed multiple septic emboli in both lung fields (Fig. 2). Transthoracic echocardiography showed vegetation on the tricuspid valve (Fig. 3) and mild tricuspid regurgitation. Methicillin-resistant *Staphylococcus aureus* was detected by both catheter tip culture and peripheral blood cultures. We diagnosed her condition as multiple septic emboli of the lung due to infective endocarditis at a tricuspid valve and therefore started intravenous administration of vancomycin (Fig. 4). During the treatment, she complained of lumbago on the right side. Magnetic resonance imaging showed right ileosacral arthritis, which



**Fig. 3.** Transthoracic echocardiography of the patient shows vegetation on the tricuspid valve



**Fig. 4.** Clinical course of the patient until she had cardiac surgery for removal of vegetation and tricuspid valvuloplasty. CPFX, ciprofloxacin; VCM, vancomycin; mPSL, methylprednisolone; PSL, prednisolone; WBC, white blood cell count; CRP, C-reactive protein

we consider was induced by systemic bacteremia. Since the treatment with intravenous antibiotics alone seemed insufficient to cure her, we performed surgical removal of vegetation and tricuspid valvuloplasty. She was discharged from our hospital without any sequelae from the disease after about 6 weeks of intravenous vancomycin therapy.

## Discussion

In the present case, the complication was identified as infective endocarditis that was likely caused by catheter-related infection in the bloodstream. The patient had a right-sided endocarditis at the tricuspid

valve, which usually occurs in intravenous drug users and is very rare in non-intravenous drug users [3,4]. It is therefore difficult to diagnose right-sided infective endocarditis in non-intravenous drug users because of its uncommonness and the low probability of detection of tricuspid regurgitation murmurs. The occurrence of septic pulmonary emboli permits the diagnosis of the presence of right-sided endocarditis, which occurs in about 75% of these patients [3,4]. On the chest radiogram, these emboli appear as multiple round infiltrates that may undergo cavitation or be complicated by empyema. We, in fact, were unable to detect the patient's cardiac murmurs. Since she was pathologically obese (body mass index 33), it was also difficult to find her septic emboli with a plain chest X-ray film. We actually diagnosed it from a chest CT film (Fig. 2), which showed typical septic emboli of multiple round infiltrates and cavities.

Though central venous catheterization is a very common practice in current medicine, it can be associated with several complications that can be hazardous to patients [1,2]. Among those complications, infectious complications are reported to occur in 5% to 26% of patients [5,6]. Although data on the number of complications in Japan are not available, in the United States approximately 35 000 cases of catheter-related *S. aureus* bacteremia are reported to occur each year, and in 6% of them infective endocarditis develops, which is associated with high morbidity and medical costs [7]. Therefore, methods to prevent and diagnose infectious complications, especially bloodstream infection, are of paramount importance when central venous catheters are used in clinical medicine. Maximal sterile-barrier precautions and prompt removal of catheters after use are of utmost importance. Several methods have been proposed to prevent infectious complications. Selection of the subclavian site appears to minimize the risk of infectious complications [6,8,9]. Antimicrobial-impregnated catheters and/or catheter hubs were reported to reduce the risks and costs [1,6]. On the other hand, the use of antibiotic ointment induces microbial substitution and increases the incidence of superinfection [10,11]. Once a catheter-associated infection is suspected, catheter site examination, two cultures of blood from peripheral sites, and, if feasible, catheter tip culture should be performed. Empirical antibiotic therapy for suspected catheter-related bloodstream infection should include vancomycin and agents that are effective against Gram-negative organisms [1,12]. Once the data from culture are available, antibiotics should be tailored according to the sensitivity of the organisms.

The patient had a critical illness and was considered to be in an immunocompromised condition due to high-dose glucocorticoid therapy. In two randomized, prospective trials, patients undergoing bone marrow

transplantation had better long-term survival after parenteral nutrition in the cyto-reduction phase; nutritional support with central venous catheters did not influence the initial infection rate [13,14]. Therefore, we should not refrain from using central venous catheters in immunocompromised hosts.

The use of prophylactic antibiotics is discouraged because of concern that it will encourage the emergence of antibiotic-resistant organisms, although most studies have demonstrated a reduction in the rate of catheter-related bloodstream infection [1]. However, we empirically prescribed parenteral ciprofloxacin immediately after insertion of the catheter in case the cause of her pneumonia was *Mycoplasma pneumoniae* or *Chlamydia pneumoniae*. Nevertheless, she suffered from infective endocarditis caused by a ciprofloxacin-resistant organism.

In summary, we describe a rare case of infective endocarditis at the tricuspid valve as a complication of central venous catheterization. Catheter-related bloodstream infections, especially infective endocarditis, are associated with high morbidity, mortality, and medical costs. Strict preventive methods and early detection and appropriate treatment of these complications are necessary to improve patients' outcome.

## References

1. McGee DC, Gould MK (2003) Preventing complication of central venous catheterization. *N Engl J Med* 348:1123–1133
2. Merrer J, De Jonghe B, Golliot E, Lefrant JY, Raffy B, Barre E, Rigaud JP, Casciani D, Misset B, Bosquet C, Outin H, Brun-Buisson C, Nitenberg G, French Catheter Study Group in Intensive Care (2001) Complication of femoral and subclavian venous catheterization in critically ill patients: a randomized controlled trial. *JAMA* 286:700–707
3. Levison ME (1996) Infective endocarditis. In: Bennett JC, Plum F (eds) *Cecil textbook of medicine*, 20th edn. Saunders, Philadelphia, pp 1596–1605
4. Karchmer AW (1997) Infective endocarditis. In: Braunwald E (ed) *Braunwald heart disease. A Textbook of Cardiovascular Medicine*, 5th edn. Saunders, Philadelphia, pp 1077–1104
5. Veenstra DL, Saint S, Saha S, Lumley T, Sullivan SD (1999) Efficacy of antiseptic-impregnated central venous catheters in preventing catheter-related bloodstream infection: a meta-analysis. *JAMA* 281:261–267
6. Raad I, Darouiche R, Dupuis J, Abi-Said D, Gabrielli A, Hachem R, Wall M, Harris R, Jones J, Buzaid A, Robertson C, Shenaq S, Curling P, Burke T, Ericsson C (1997) Central venous catheters coated with minocycline and rifampin for the prevention of catheter-related colonization and bloodstream infection: a randomized, double-blind trial. *Ann Intern Med* 127:267–274
7. Mark DB (2001) Decision-making in clinical medicine. In: Braunwald E, Fauci AS, Kasper D, Hauser SL, Longo DL, Jameson JL (eds) *Harrison's principles of internal medicine*, 15th edn. McGraw-Hill, New York, pp 8–14
8. Heard SO, Wagle M, Vijayakumar E, McLean S, Brueggemann A, Napolitano LM, Edwards LP, O'Connell FM, Puyana JC, Doern GV (1998) Influence of triple-lumen central venous

- catheters coated with chlorhexidine and silver sulfadiazine on the incidence of catheter-related bacteremia. *Arch Intern Med* 158:81–87
9. McKinley S, Mackenzie A, Finfer S, Ward R, Penfold J (1999) Incidence and predictors of central venous catheter related infection in intensive care patients. *Anesth Intensive Care* 27:164–169
  10. Flowers RH, Schwenzer KJ, Kopel RF, Fisch MJ, Tucker SI, Farr BN (1989) Efficacy of an attachable subcutaneous cuff for the prevention of intravascular catheter-related infection: a randomized, controlled trial. *JAMA* 261:878–883
  11. Zakrzewska-Bode A, Muijtens HL, Liem KD, Hoogkamp-Korstanje JA (1995) Mupirocin resistance in coagulase-negative staphylococci, after topical prophylaxis for the reduction of colonization of central venous catheters. *J Hosp Infect* 31:189–193
  12. Jernigan JA, Farr BM (1993) Short-course therapy of catheter-related *Staphylococcus aureus* bacteremia: a meta-analysis. *Ann Intern Med* 119:304–311
  13. Weisdorf SA, Lysne J, Wind D, Haake RJ, Sharp HL, Goldman A, Schissel K, McGlave PB (1987) Positive effect of prophylactic total parenteral nutrition on long-term outcome of bone marrow transplantation. *Transplantation* 43:833–838
  14. Ziegler TR, Young LS, Benfell K, Scheltinga M, Hortos K, Bye R, Morrow FD, Jacobs DO, Smith RJ, Antin JH (1992) Clinical and metabolic efficacy of glutamine-supplemented parenteral nutrition after bone marrow transplantation. A randomized, double-blind, controlled study. *Ann Intern Med* 116:821–828