

## Case Report

# Tricuspid Valve Repair for Infective Endocarditis Caused by Atopic Dermatitis

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## Abstract

**Background:** Right Side Infective Endocarditis (RSIE) is known to occur frequently among injecting drug users and pacemakers, but there are few reports of other causes. In this case, the only underlying disease was uncontrolled atopic dermatitis. In this paper, we reported RSIE, which is thought to be caused by atopic dermatitis, there is no report of tricuspid valve repair using bovine pericardial patch, and it is extremely rare.

**Case presentation:** The patient was a 38-year old male with atopic dermatitis who consulted a physician at a local hospital for a 38°C fever. Antibiotics were prescribed but the patient's condition did not improve. Computed Tomography (CT) of the chest indicated pneumonia, but the patient's condition did not improve despite a second course of antibiotics. Blood culture revealed *Staphylococcus aureus* and transthoracic echocardiography showed the presence of vegetation on the tricuspid valve. The patient was diagnosed with infective endocarditis and began appropriate medical treatment. However, our patient presented with vegetation measuring more than 20 mm in size and was complicated with pulmonary embolism in addition to tricuspid regurgitation that was gradually worsening, therefore requiring surgical treatment.

**Conclusion:** Tricuspid valve repair was performed using a bovine pericardial patch, and a favorable outcome was achieved, showing its potential for the treatment of tricuspid regurgitation caused by infective endocarditis.

**Keywords:** Tricuspid valve repair; Right sided infective endocarditis; Atopic dermatitis

## Background

Right Side Infective Endocarditis (RSIE) is known to occur frequently among injecting drug users and pacemakers, but there are few reports of other causes. In this case, the only underlying disease was uncontrolled atopic dermatitis. The causative organism was *Staphylococcus aureus*. In general, RSIE is often relieved by administration of antibiotics, and it is said that surgical intervention is rarely required. This case showed an exacerbation tendency despite the administration of antibiotics, and pulmonary embolism was also observed, so it was judged that surgical treatment was indicated. In this paper, we reported RSIE, which is thought to be caused by atopic dermatitis, there is no report of tricuspid valve repair using bovine pericardial patch, and it is extremely rare.

## Case Presentation

A 38-year old male presented to a local hospital due to fever (38°C) and respiratory discomfort. Levofloxacin was prescribed and the patient was followed up for approximately 7 days, without improvement. Due to respiratory discomfort, the patient was referred

to our hospital's department of pulmonary medicine. Chest CT showed infiltrative shadows in both lungs, indicating pneumonia, and tazobactam therapy was started. However, the patient's symptoms persisted. *Staphylococcus aureus* was detected in the hemoculture, prompting switching of antibiotics starting from hospital day 6 to meropenem and linezolid but without apparent improvement. On hospital day 15, ultrasound cardiography revealed the presence of vegetation on the tricuspid valve (Figure 1 A and B), establishing the diagnosis of infective endocarditis and requiring the transfer of the patient to the department of cardiology. Cefazolin sodium and linezolid were administered intravenously and rifampicin was administered orally. The inflammatory response improved gradually, but the chest CT showed bilateral pulmonary embolism (Figure 2 A and B) and Transthoracic Echocardiography (TTE) findings revealed the presence of a vegetation measuring 21 mm × 14 mm (Figure 3 A and B) on the tricuspid valve, as well as mild TR. Therefore, surgical treatment was indicated. Tricuspid valve repair was performed on hospital day 50. There were no abnormal findings at the aortic valve, the mitral valve or the pulmonary valve. There was no atrial or ventricular defect with left-right shunt (systemic-to-pulmonary shunt). The cardiac parameters were as follows: ejection fraction: 62%. Preoperative laboratory findings indicated significantly elevation of the white blood cell count of  $29.60 \times 10^3/\mu\text{L}$  and C-reactive protein of 36.74 mg/dl. Chest CT: Findings showed pneumonia and embolic lesions bilaterally in the periphery of the pulmonary arteries (Figure 4 A and B).

**Intraoperative findings:** Transesophageal echocardiography was performed after induction of anesthesia, which revealed expanding vegetation and mild to moderate Tricuspid valve Regurgitation (TR) (Figure 3 A and B). Median sternotomy was performed; cardiopulmonary bypass was established with cannulation of the ascending aorta for arterial return and cannulation of the superior

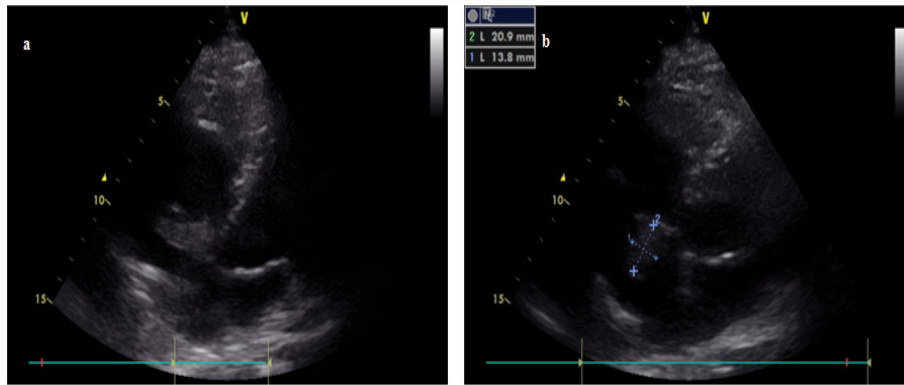
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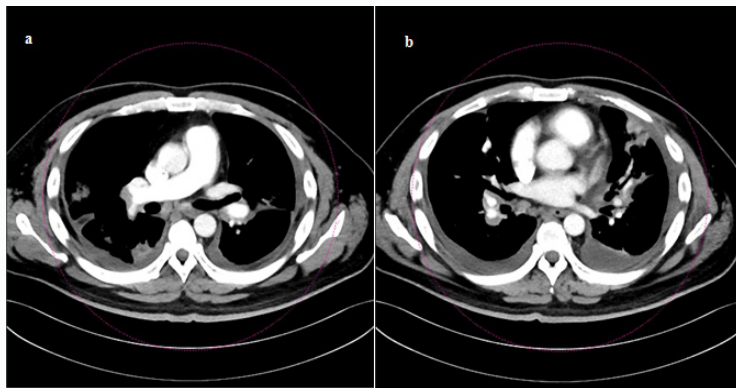
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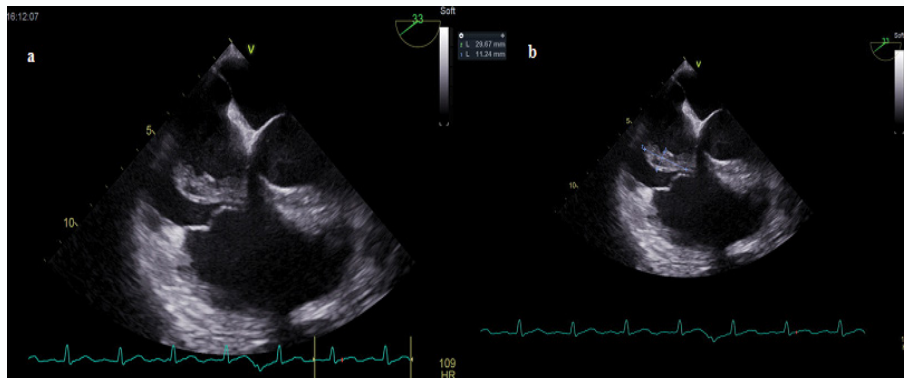
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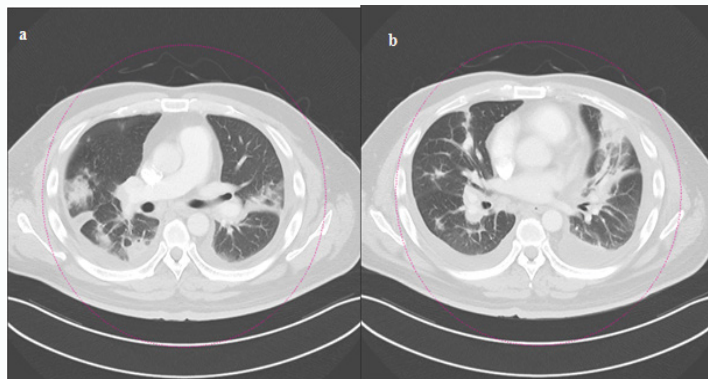
**Figure 1:** A and B) Ultrasound cardiography revealed the presence of a vegetation measuring 21 mm × 14 mm on the tricuspid valve.



**Figure 2:** A and B) Chest CT showed bilateral pulmonary embolism.



**Figure 3:** A and B) Vegetation was showed a tendency toward exacerbation.



**Figure 4:** A and B) Chest CT showed pneumonia bilaterally.

and inferior vena cava for drainage. The tricuspid valve was reached by incising the right atrium under cardiac arrest. A large and fragile vegetation was found on the entire septal leaflet of the tricuspid valve, and the valve tissue had been destroyed (Figure 5A), therefore preservation of the valve was almost impossible. The anterior and posterior leaflets showed no apparent vegetations. The septal leaflet was resected, a bovine pericardial patch was trimmed to 50 mm × 70 mm, and the septal leaflet was reconstructed (Figure 5b).

**Discussion and Conclusions**

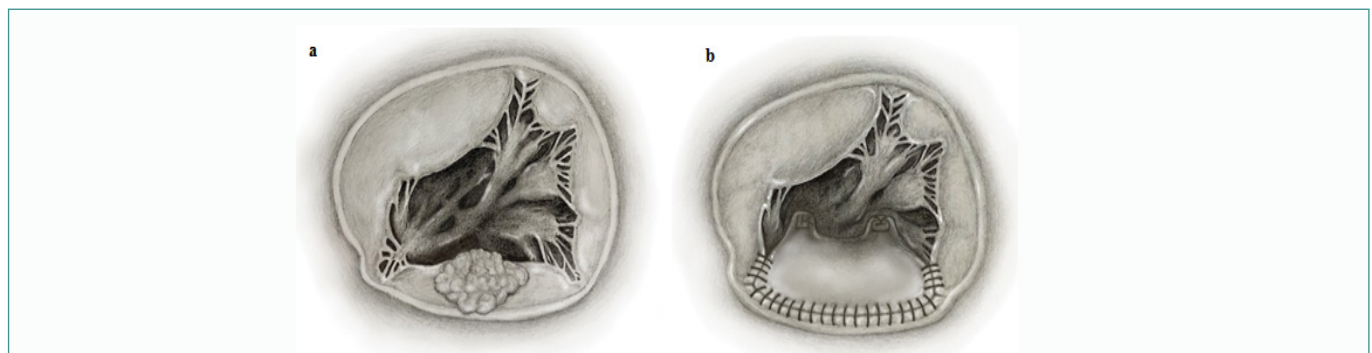
RSIE accounts for 5% to 10% of all cases of infective endocarditis and the majority develops at the tricuspid valve. In most cases, RSIE is mainly caused by the routine use of intravenous drugs or the placement of an indwelling pacemaker [1]. In rare cases, RSIE can also occur as a complication of congenital heart diseases with systemic-to-pulmonary shunt [2]. In most cases, the causative microorganism is *Staphylococcus aureus* [1], resulting in patients developing symptoms such as fever, cough, and a sensation of breathing difficulty. In the case reported in our study, the patient had no particular history that may suggest any of the causes listed above. Since, the patient was suffering from atopic dermatitis; this was the only possible cause. Most cases of infective endocarditis caused by skin diseases are due to *Staphylococcus aureus*, which was also the causative organism in our study. Left-sided infective endocarditis had been reported in these cases [3] and there has been no report of RSIE caused by any skin disease. The route of infection of the tricuspid valve remains unclear.

Most cases of RSIE are responsive to medical treatment using antibiotics [1,2]. Surgery is indicated in approximately 10% - 20% of RSIE [2,4,5], namely in the case of persistence of sepsis despite

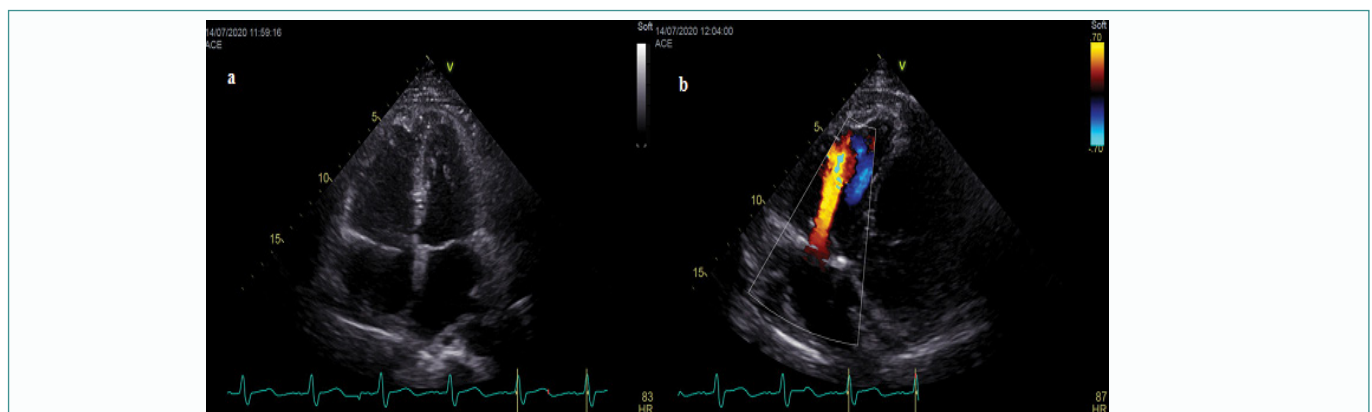
medical treatment, persistence of severe right heart failure, and presence of vegetations measuring 20 mm or greater that leads to pulmonary embolism [6,7]. Previously reported surgical treatments included prosthetic valve replacement, valvuloplasty and the use of mitral valve homografts [8]. The problem with the use of prosthetic valve replacement is the increased incidence of recurrence of infection; particularly because atopic dermatitis is difficult to cure completely. The likelihood of recurrence is believed to be higher in this case than in RSIE due to other causes; this is why prosthetic valve replacement should preferably be avoided. The problematic issue with homografts is that they are not available in sufficient supply in Japan. Therefore, we opted to perform a valvuloplasty. The use of fresh autologous pericardial patches may lead to valvular dysfunction due to dystrophic changes such as calcification, thus requiring anti-calcification treatment, as well as glutaraldehyde [9,10]. However, the use of glutaraldehyde is not permitted in our hospital. For these reasons, a bovine pericardial patch was used in the case reported in our study. Favorable outcomes have been achieved previously, even when such patches were used for valve repair in the left heart where pressure is high.

In valve repair, autologous pericardium is a useful material and a valid option. However, if it cannot be fixed with glutaraldehyde, long-term outcomes will be affected by changes such as calcification. Therefore, bovine pericardial patches processed with anti-calcification treatment were considered to provide better long-term outcomes than the fresh autologous pericardial patches [11].

In the procedure, the shorter side of the trimmed bovine pericardial patch was fixed to the septal annulus of the tricuspid valve



**Figure 5:** A and B) A large and fragile vegetation was found on the entire septal leaflet of the tricuspid valve. Tricuspid valve was reconstructed by a bovine pericardial patch.



**Figure 6:** A and B) Transthoracic ultrasonography showed no tricuspid regurgitation.

using a 6-0 polypropylene thread, and the tricuspid commissure was created by fixing both sides to the anterior leaflet and the posterior leaflet. The longer side of the bovine pericardial patch was trimmed according to the lengths of the anterior and the posterior leaflets' chordae tendineae; then the right ventricular papillary muscle was fixed to the chordae tendineae by suturing directly at two separate locations with a 5-0 polypropylene thread. The patch was prepared to have a size slightly larger than the distance from the tricuspid annulus to the papillary muscle. This is believed to secure a sufficiently large junctional zone between the anterior leaflet and the posterior leaflet, which helps prevent tricuspid regurgitation. After removal of the cardiopulmonary bypass, transesophageal ultrasonography was performed again and the findings showed that the regurgitation had been successfully controlled.

The postoperative clinical course was also uneventful, there was no recurrence of infection and the transthoracic ultrasonography showed no TR (Figure 6 A and B). The inflammatory reaction became negative, and at day 28 after surgery, the administration of antibiotics was changed from the intravenous to the oral route, and the patient was discharged from the hospital. The long-term outcomes of bovine pericardial patches are still unknown; therefore, a long-term follow-up of the clinical course will need to be conducted in the future.

Further, in infective endocarditis caused by atopic dermatitis, postoperative skin management is also important. To prevent recurrence, patients have to be strictly instructed to keep their skin clean, and the management of the condition needs to be carried out in cooperation with a dermatologist.

## Declarations

### Consent for publication

Written consent to publish this information was obtained from the participants.

### Availability of data and materials

The data used in this study are available from the corresponding author upon reasonable request.

### Authors' contributions

MO wrote and drafted the manuscript. All authors read, critically revised and approved the final manuscript.

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