

## 4 valve endocarditis confirmed by intraoperative transesophageal echocardiography leads to successful quadruple valve replacement

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Applied Cardiopulmonary Pathophysiology 13: 134-137, 2009

### Introduction

A number of recent reviews have described in detail the echocardiographic findings that offer sufficient evidence of infective endocarditis. To avoid duplications we use an illustrative case of infective four valve endocarditis to introduce this topic and proceed to give a short but comprehensive review of the „Duke Criteria of Infective Endocarditis“.

### Case report

A 76-year-old man presented to a peripheral hospital in a reduced general condition, symptoms of heart failure and fever (38,5°C). Seven months before admission, he had suffered recurrent pulmonary embolisms associated with an episode of severe pneumonia. His medical history of note included chronic renal- and factor XIII-insufficiency, chronic obstructive pulmonary disease, monoclonal gammopathy (IgG), hypertension and hypercholesterolemia. The transthoracic echocardiogram (TTE) demonstrated a triple valve endocarditis affecting the tricuspid, pulmonary and aortic valves. No specific comment was made regarding abnormalities of the mitral valve structure; however a systolic jet taking in 2/3 of the left atrium was interpreted as moderate mitral regurgitation. LVEF and cardiac angiography were unremarkable. After transfer to our hospital the patient was scheduled for urgent surgery. Based on the TTE findings, the surgical plan was to replace all three affected valves. Based on the intraoperative transesophageal echocar-

diography (TEE) findings, mitral valve repair was attempted.

The TEE examination performed after induction of anesthesia confirmed the preoperative diagnosis of a triple valve endocarditis involving the tricuspid, pulmonary and aortic valves, but also revealed mitral valve endocarditis: In the midesophageal four chamber view mobile vegetations on the mitral as well as on the tricuspid valve were seen. Additionally, severe regurgitation was demonstrated by color flow doppler imaging across both valves (Figure 1/TEE video loop 1\*). Aortic valve endocarditis was confirmed in the midesophageal long axis view of the aortic valve which showed an oscillating vegetation as well as concomitant severe regurgitation (Figure 2/TEE video loop 2). Midesophageal view of the right ventricular inflow-outflow tract then confirmed the diagnosis of a four valve endocarditis. Again mobile masses as well as concomitant severe regurgitation were found on the tricuspid and pulmonary valve, respectively (see figure 3/TEE video loops 3). Surgical inspection confirmed the above mentioned echocardiographic diagnoses and a four valve replacement was performed using 31 and 33mm SJM®-Epic-Mitral Model prosthesis for mitral and tricuspid valve replacement, respectively. A 23mm SJM®-Epic-Aortic-Model prosthesis for the aortic valve replacement and a 27mm Medtronic® Freestyle prosthesis in the pulmonary valve position. Additionally, a pacemaker lead (Medtronic®, Germany) was attached epimyocardially. The patient was successfully weaned after 183 min of aortic cross clamp time and after 265 min of cardiopulmonary bypass. Moderate inotropic support was required. The

\* Loop 1-3 see <http://www.applied-cardiopulmonary-pathophysiology.com/acp-2-2009.html>

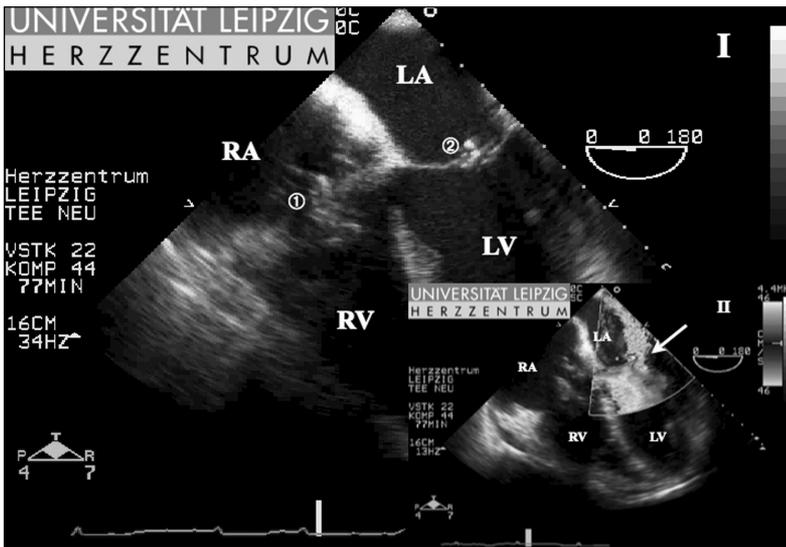


Figure 1. Intraoperative midesophageal four chamber view at a multiplane angle of 0 degree (I) demonstrates the preoperative known vegetation at the atrial and ventricular side of the tricuspid valve (⊙), but also revealed a vegetation on the mitral valve (⊚). The color flow Doppler (II) in the same view visualizes the severe mitral insufficiency (←). RA = right atrium; LA = left atrium; RV = right ventricle, LV = left ventricle

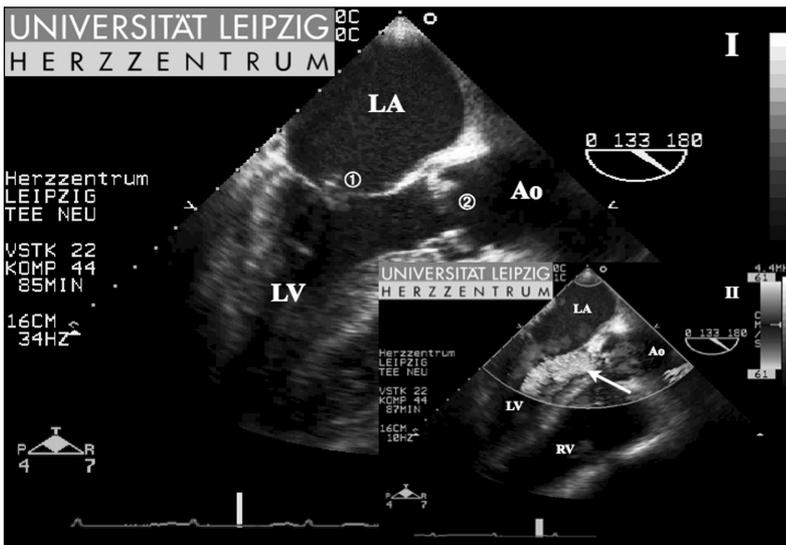


Figure 2. (I) Intraoperative midesophageal long axis view of the aortic valve at a multiplane angle of 133 degrees. Vegetations on ventricular and atrial side of the mitral valve are demonstrated (⊙). Additionally, vegetations on the aortic valve are shown (⊚). (II) In the same view the color Doppler demonstrates a concomitant severe regurgitation in the left ventricular outflow tract (←). LA = left atrium; LV = left ventricle; RV = right ventricle; Ao = ascending

postcardiopulmonary bypass TEE examination confirmed normal function of all valve prostheses. The postoperative course was complicated by a new-onset hemiplegia due to intra-cerebral bleeding and recurrent gastric bleeding leading to a Billroth II operation. Nevertheless, the patient was discharged to a rehabilitation facility three months after surgery in generally good health.

## Discussion

Despite great medical advances, infective endocarditis is still challenging to diagnose with certainty. This is in part caused by the inaccessibility of intracardiac vegetations to standard clinical examination and the highly variable and sometimes nonspecific nature of the clinical manifestations. Because the reliability of echocardiography depends upon the quality of available resources and the skills of the echocardiographer, some authors still question its role (1). However when combined with other diagnostic information, the high detection rate of vegetations and other intracardiac le-

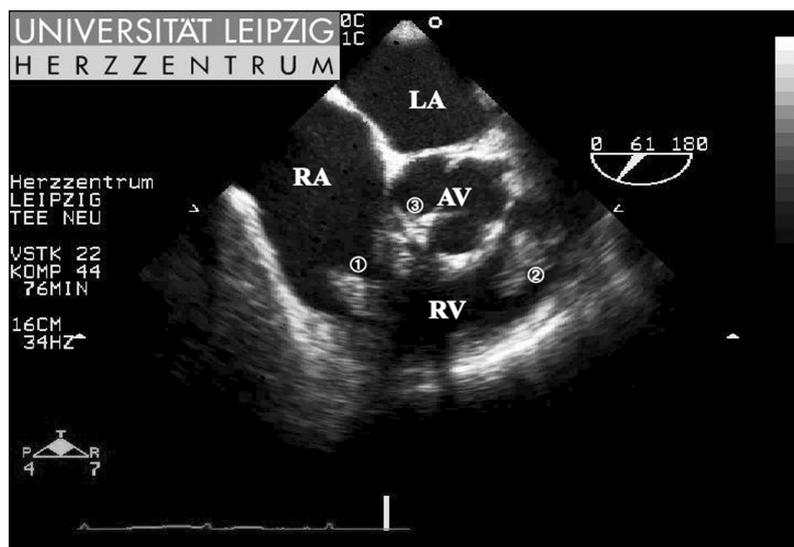


Figure 3. Intraoperative midesophageal view of the right ventricular inflow-outflow tract at a multiplane angle of 61 degrees visualizes tricuspid- (①), pulmonary- (②) and aortic valve (③) endocarditis. RA = right atrium; LA = left atrium; RV = right ventricle, AV = aortic valve

sions using modern echocardiography, can greatly assist in making the correct diagnosis (2). In this context it is important to note that the transesophageal technique is save and more sensitive than transthoracic echocardiography for detecting vegetations (3). In the case presented here, the oscillating mass on the mitral valve was not seen using transthoracic echocardiography and lead, after detection by TEE, to an extensive change in the surgical procedure. Additionally, TEE is more sensitive for the detection of important endocarditic complications such as abscesses or valve perforation (4). The „Duke Criteria of Infective Endocarditis“ (5), list three echocardiographic findings that offer sufficient evidence of endocardial involvement to be considered „Major Criteria“: 1. *Oscillating intracardiac mass*: These masses occur typically on valves, chordae or in the path of turbulent jets of blood passing through incompetent valves or septal defects. 2. *Intracardiac abscess*. They are detected much less commonly than vegetations but are highly suspicious for infective endocarditis. 3. *New partial dehiscence of a prosthetic valve*: Because periprosthetic leaks occur after valve implantation in 10% to 15% of patients in the absence of infection, it is important to document any dehiscence as new or old.

In summary, our case underlines the outstanding role of transesophageal echocardiography in the diagnosis of infective endocarditis today, and that it should therefore be performed in all patients with suspected endocarditis (5). It is important to complete this examination in a structured, thorough and reproducible way as proposed in the current ASE/SCA recommendations

(6). Additionally, to the best of our knowledge, the current report is the first to describe successful quadruple valve replacement for acute endocarditis.

## Summary

A number of recent reviews have described in detail the echocardiographic findings that offer sufficient evidence of infective endocarditis. To avoid duplications we use an illustrative case of infective four valve endocarditis to introduce this topic and proceed to give a short but comprehensive review of the „Duke Criteria of Infective Endocarditis“.

Our case report underlines the outstanding role of transesophageal echocardiography in the diagnosis of infective endocarditis. An oscillating mass on the mitral valve was not seen preoperatively using transthoracic echocardiography and leads, after detection by TEE intraoperatively, to an extensive change in surgical procedure.

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