Biventricular infective endocarditis in an immunocompetent adult patient with a congenital ventricular septal defect: a case report

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Introduction
Congenital heart defects predispose patients to a significantly increased risk of infective endocarditis (IE), and the incidence is even greater in the immunocompromised population. The involvement of multiple valves leads to a higher rate of complications and thus mortality. Moreover, biventricular IE is an uncommon condition with no specific guidelines for treatment.

Case presentation
In this report, we discuss a case of an immunocompetent young male with a congenital perimembranous ventricular septal defect, complicated by multivalvular and right ventricular free wall vegetations. Biventricular involvement of IE along with septic embolization to both the pulmonary and systemic circulation resulted in challenges in the management of this patient.

Discussion
The decision regarding timing and type (surgical vs. conservative) of treatment in such a complicated and aggressive IE case should be based on individual circumstances. However, the strategy of initial antibiotic therapy followed by surgical intervention can be a suitable option in such patients.

Keywords
Infective endocarditis • Ventricular septal defect • Biventricular • Mural • Embolization • Case report

Learning points
- Biventricular infective endocarditis is very rare entity.
- No specific guidelines and data available for management of such patients.
- Identification of peripheral complications is crucial in advance cases.
- Timings of surgical intervention is important prognostic step.
- Completion of antibiotics even after surgery is recommended.

Introduction
The risk of infective endocarditis (IE) in patients with congenital heart disease is a major concern. In adults with congenital heart disease, the incidence of IE is as high as 11 per 100 000 patients compared with 1.5–6.0 per 100 000 patients in the general population.1,3 The risk of infection differs substantially between congenital cardiac malformation types (unrepaired, repaired, and palliated).

For patients with a ventricular septal defect (VSD), the incidence of IE is reportedly as high as 14.5 per 10 000 patients.3 Vegetations are classically found along the atrial surface of the atrioventricular valves and on the ventricular surface of ventriculoarterial valves.4 Here, we report a case of perimembranous VSD complicated by multivalvular and right ventricular free wall vegetations. Biventricular involvement of IE along with septic embolization to multiple organs posed challenges when managing this patient.

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A 29-year-old male presented with a 2-month history of low-grade fever, fatigue, malaise, significant weight loss, exertional dyspnoea of New York Heart Association functional class II/III, productive cough, and pain in the upper chest and neck. The patient was diagnosed with a congenital cardiac defect in childhood, but had never been treated by a cardiologist. The patient had a history of smoking (14 pack years) and occasionally used oral recreational drugs (Captagon, which contains Fenethylline), but had never used intravenous (IV) drugs. In addition, there was no history of recent dental work.

Upon examination at the time of presentation, the patient was afebrile and tachycardic with a pulse rate of 142 b.p.m, blood pressure 136/70 mmHg, and a respiratory rate of 41 breaths/min. Transthoracic echocardiography performed 2 weeks after starting antibiotics revealed no significant change in vegetation size or valvular dysfunction. Surgery was conducted 3 weeks after initial admission to replace the aortic valve with a mechanical ATS valve (20 mm) after removal of the vegetation and closure of the perimembranous VSD with continuous prolene suture. The pulmonary valve was replaced with a pulmonary homograft (21 mm). The mitral valve was repaired with a comissuroplasty after removing the vegetation. The patient remained stable postoperatively and was discharged after 6 weeks of antibiotics.

Transthoracic echocardiography was performed before discharge and showed moderate global hypokinesis of the left ventricle. The right ventricular systolic functions were moderately reduced. There was mild to moderate mitral regurgitation. Both aortic and pulmonary prostheses were well seated with normal functions (see Supplementary material online, Video S5).
On follow-up at 2 weeks, the patient was vitally stable, but complained of mild exertional dyspnoea (NYHA FC I/II). The patient’s international normalized ratio was within therapeutic range (2.9). At the next visit (3 months after discharge), the patient was asymptomatic with routine activities.

Discussion

Infective endocarditis carries a high risk of morbidity and mortality. Better clinical outcomes can be achieved by rapid diagnosis, targeted treatment, and early recognition of complications.\textsuperscript{5} Congenital heart diseases make patients more prone to IE, and the risk of IE is highest in Tetralogy of Fallot cases followed by bicuspid aortic valve, coarctation of the aorta, and VSD cases.\textsuperscript{6} Frontera-Izquierdo et al.\textsuperscript{7} observed an incidence of only 0.5% in 882 patients with isolated VSD. Otterstad et al.\textsuperscript{8} reported an incidence of 15% in 109 patients with isolated VSD diagnosed after the age of 15 years (range 15–65).

The pulmonary valve is the least commonly affected valve by IE. Cases with quadruple-valve IE with VSD have been reported in the literature; however, multivalvular IE with involvement of the RV free wall and RVOT secondary to VSD in an immunocompetent young male has been rarely reported.\textsuperscript{9}

The exact mechanism of biventricular IE is still unclear. It is thought that organisms are usually shunted to the right side through the septal defect from the left side, which is the initial site of infection. The right ventricular wall and valves are damaged due to restrictive turbulent flow through the VSD, which serve as seeding places for infections. Alternatively, several studies have suggested that initial right-sided infections can involve mitral and aortic valves either due to a transient right to left shunt or an extracardiac shunt.\textsuperscript{10} Streptococcus species, including \textit{S. viridans}, \textit{S. bovis}, and enterococci are responsible for

| Table 1  | Laboratory investigations done at presentation and after 1 week of antibiotics |
|----------|--------------------------------------------------------------------------------|
|          | **Normal values** | **At presentation** | **After 1 week** |
| White cell count (10^9/L) | 3.9–11 | 8.48 | 9.81 |
| Neutrophils (%) | 30–70 | 68.70 | 61.70 |
| Eosinophils (%) | 1–12 | 0.20 | 1.40 |
| Platelet count (10^9/L) | 155–435 | 479 | 434.00 |
| Haemoglobin (g/dL) | 11–16 | 9.70 | 9.80 |
| CRP (mg/L) | <3 | 3.1 | NA |
| INR | 0.81–1.23 | 1.4 | 1.2 |
| ALT (U/L) | 0–55 | 66 | 55 |

CRP, C-reactive protein; INR, international normalized ratio; NA, not available.
approximately 70% cases of native valve endocarditis. Staphylococcus species cause 25% of cases and usually result in an acute but aggressive course. In our case, *E. faecium* was the culprit organism. This infection had an unusually aggressive course involving multiple valves and the ventricular wall, and resulted in both pulmonary and systemic embolic complications. Other factors associated with increased morbidity and mortality include old age, congestive heart failure, cardiac abscess, extracardiac complications, and high C-reactive protein.11

The incidence of embolic complications is highest during the first week of diagnosis,12,13 and a recent randomized study revealed that early surgery is better compared with conservative management in reducing embolization in large size vegetations.14 Although the exact role of early surgical intervention to prevent embolization remains unknown, current guidelines suggest early surgery if embolization from large vegetation (>10 mm) occurs despite appropriate antibiotic therapy.15 There is a lack of sufficient data for the management of patients with multivalvular and mural IE with congenital heart defects, but in our opinion, the same guidelines can be applied to such individuals. Our patient had multiple vegetations attached to the mitral, aortic, and pulmonary valves, as well as the RV free wall, RVOT, and pulmonary artery. He had multiple septic emboli in the lungs, spleen, and liver. The patient was started on appropriate antibiotics to decrease the infection burden and surgery was performed once blood cultures were negative.

In summary, multivalvular and mural IE is a rare but serious condition. The extent of cardiac and extracardiac involvement helps determine the management plan. The decision regarding timing and type (surgical vs. conservative) of treatment in such a complicated and aggressive case of IE should be individualized.15 The strategy of initial antibiotic therapy followed by surgical intervention can be a suitable option in these patients. It is advisable to complete the course of antibiotics for minimum of 6 weeks, even after surgery.

**Supplementary material**

Supplementary material is available at *European Heart Journal* - Case Reports online.

**Consent:** The author/s confirm that written consent for submission and publication of this case report including image(s) and associated text has been obtained from the patient in line with COPE guidance.

**Conflict of interest:** none declared.

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