Infective endocarditis on interventricular communication as cause of massive haemoptysis: a case report

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Background
Haemoptysis is a rare symptom associated with endocarditis. We describe the unusual clinical manifestation of endocarditis on regurgitant bicuspid aortic valve and (probably) secondarily on a perimembranous ventricular septal defect (VSD) as massive haemoptysis.

Case summary
A 24-year-old male with aortic coarctation, bicuspid aortic valve, and VSD since birth. Previously asymptomatic, he came after an episode of haemoptysis. A computed tomography (CT) scan showed a cavitated lesion in lung. Streptococcus viridans was identified in serial blood cultures. Transthoracic echocardiography showed a bicuspid aortic valve with vegetations, suggesting infectious involvement, and severe aortic insufficiency. Transoesophageal echocardiography (TEE) study showed a bicuspid aortic valve with complete fusion of coronary valves. An elongated oscillating tumour, 9.5 mm in length, was observed in the centre of the ventricular side of the non-coronary valve. Another vegetation was seen on the VSD. During his hospital stay and under antibiotic treatment, he reported abdominal pain. Computed tomography examination showed splenic infarction. In the echocardiogram no vegetation masses were observed on the aortic valve or on the VSD closure aneurysm.

Discussion
The main debate about this patient’s treatment concerned the indication of surgery, especially after the onset of fever with splenic septic embolism while under appropriate antibiotic treatment. He was stable, with no signs of heart failure and the echocardiogram repeated after the septic splenic embolism showed no residual vegetations on the aortic valve or VSD, and the TEE study ruled out a local complication. Finally, the multidisciplinary team decided against surgical management.

Keywords
Endocarditis • Congenital heart malformation • Haemoptysis • Case report

ESC Curriculum
2.2 Echocardiography • 2.4 Cardiac computed tomography • 2.1 Imaging modalities • 4.1 Aortic regurgitation • 4.11 Endocarditis

Learning points
• The incidence of endocarditis among patients with heart disease ranges between 15 and 140 times higher than that in the general population, according to the degree of haemodynamic involvement. Bicuspid aortic valve is one of the diseases with highest risks of endocarditis. Patients with VSD have 4–6 times higher risk of endocarditis compared with the general population.
• Antibiotic treatment may be a valid option if imaging tests show resolution of vegetations, blood cultures are normal, and the patient is clinically stable, even if there were previous embolisms.
Introduction

Bicuspid aortic valve is the most frequent congenital heart malformation observed in adults. It affects 1.3% of the population and is deemed responsible for more deaths and complications than all other congenital heart diseases together. The incidence of endocarditis is between 15- and 140-fold higher among patients with heart disease than the general population, according to the degree of haemodynamic involvement.1

Ventricular septal defect is the second most frequent congenital malformation of the heart, with a prevalence of 30–40%, and it is perimembranous in around 80% of cases. The risk of endocarditis is 4–6-fold greater in these patients than in the general population, and embolic phenomena are among the most frequent sequelae, with possible embolization to the systemic and/or pulmonary circulation.2

We report an unusual clinical presentation of infective endocarditis in a patient with congenital heart disease.

Timeline

| Timeframe                      | Event Description                                                                 |
|-------------------------------|-----------------------------------------------------------------------------------|
| Birth                         | Congenital heart malformation: aortic coarctation, bicuspid aortic valve, and ventricular septal defect (VSD) |
| 8 days of life                | The patient had undergone surgery to widen the coarcted segment with a Gore-Tex patch |
| From birth to 23 years        | Progression of aortic insufficiency, which was classified as moderate, with the appearance of a subaortic membrane without haemodynamic repercussions |
| Subsequent periodic follow-ups| Magnetic resonance imaging (MRI) scan of the heart revealed a moderately restrictive perimembranous VSD, with Qp/Qs of 1.6, and subaortic membrane with no gradients. The Qp/Qs cannot be accurately accessed in the setting of moderate aortic regurgitation. The speed of the flow over the VSD on the transthoracic echocardiography (TTE) was 5.7 m/s. No complications of the Gore-Tex patch aortoplasty were detected |
| 23 years and 6 months         | Prostatitis with a good response to medical treatment with ciprofloxacin |
| 23 years and 11.5 months      | Episodes of shivering with heavy sweating |
| 23 years and 11.5 months      | Transient episode of deafness (probably portal of entry) |
| 24 years. Day 0               | Haemoptysis (approximately half litre of blood) |
|                               | Admission to hospital. ICU admission |
|                               | An emergency computed tomography (CT) scan showed lung abscesses |

Day 1

Day 2

Day 3

Day 9

Day 12

Day 14

Day 15

Day 16

Day 17

Day 37

Day 48

Nine months

Continued

Day 2

Day 3

Day 9

Day 12

Day 14

Day 15

Day 16

Day 37

Day 48

Nine months

Continued

Day 2

Day 3

Day 9

Day 12

Day 14

Day 15

Day 16

Day 37

Day 48

Nine months

Continued

- Complementary tests showed no anaemia, leukocytosis, or neutrophilia.
- Renal and hepatic function and ions were within normal ranges, while C-reactive protein and procalcitonin values were elevated. Streptococcus viridans (S. oralis) was identified in serial blood cultures
- Transthoracic echocardiography showed a bicuspid aortic valve with vegetations, suggesting infectious involvement
- Initiation of antibiotic therapy with gentamycin and ceftriaxone
- Streptococcus viridans (S. oralis) was identified in serial blood cultures
- Transoesophageal echocardiography (TEE) study showed a bicuspid aortic valve with complete fusion of coronary valves and two elongated and oscillating vegetations. No periannular involvement was detected, and there were no signs of valve destruction
- Another elongated and oscillating vegetation, around 11.3 mm in length, was seen on the side of the VSD outlet, adhered to the aneurysm closure
- Multidisciplinary team decided against surgery

Day 9

Day 12

Day 14

Day 15

Day 16

Day 37

Day 48

Nine months

Continued

- Pruriginous skin rash
- Multidisciplinary team decided against surgery
- Initiation of antibiotic therapy with penicillin
- Stop treatment antibiotic
- Hospital discharge
- Patient is asymptomatic with NYHA functional Grade I
- Transoesophageal echocardiography: vegetations on the aortic valve had disappeared, and there were no signs of progression of the infection at this level

Continued
Clinical report

A 24-year-old male with aortic coarctation, bicuspid aortic valve, and a VSD had undergone surgery at the age of 8 days to widen the coarcted segment with a Gore-Tex patch. His only other relevant medical history was surgery for clubfoot. Subsequent periodic follow-ups revealed the progression of aortic insufficiency, which was classified as moderate at the most recent follow-up, with the appearance of a subaortic membrane without haemodynamic repercussions. In 2011, a MRI scan of the heart revealed a moderately restrictive perimembranous VSD, with Qp/Qs of 1.6, and subaortic membrane with no gradients. No complications of the Gore-Tex patch aortoplasty were detected.

Previously asymptomatic, the patient was referred to our department after an episode of haemoptysis (approximately half litre of blood). An emergency CT scan showed a cavitated lesion in the right medial basal lung, with a small aneurysm in the associated segmental artery, as well as other lesions in the lung parenchyma, some cavitated, and in the subpleural region.

Infectious disease with multiple haematogenous lung abscesses and vasculitis were considered in the differential diagnosis. Review of his clinical records disclosed an episode of prostatitis six months earlier, that had responded well to medical treatment with ciprofloxacin. He described episodes of shivering with heavy sweating in the previous few weeks and a transient episode of deafness in the week before admission. He was not taking regular medication.

Examination showed a well general appearance with normal jugular venous pressure, precordial fremitus, and full and symmetric carotid pulsation with bilateral carotid murmurs. Heart sounds were rhythmic with Grade 4/6 holosystolic murmur at left lower sternal border, ejection murmur, and long diastolic murmur in the aortic area. The patient had no skin lesions, nail bed lesions, or ocular manifestations of endocarditis. There was no oral pathology. No anomalies were detected by lung auscultation and abdomen palpation, no oedema were observed on lower limbs and distal pulses were preserved.

Complementary tests showed no anaemia, leucocytosis, or neutrophilia. Renal and hepatic functions and ions were within normal ranges, while C-reactive protein and procalcitonin values were elevated. The proteinogram was normal and autoimmunity tests were negative.

Streptococcus viridans (S. oralis) was identified in serial blood cultures; it was susceptible to cefotaxime, daptomycin, levofloxacin, linezolid, penicillin, and vancomycin but resistant to clindamycin and erythromycin.

Transsthoracic echocardiography showed a bicuspid aortic valve with vegetations, suggesting infectious involvement and severe aortic insufficiency, with progression of the regurgitation with respect to previous studies. Left ventricle was slightly dilated when adjusted to body surface area, with progression of the regurgitation with respect to previous vegetations, suggesting infectious involvement and severe aortic insufficiency.

The main debate around the treatment of this patient concerned the indication of surgery, especially after the onset of fever with splenic territory and lung parenchyma, giving rise to haemoptysis as the first symptom.

There are very few reports on haemoptysis associated with infective endocarditis, mainly related to the involvement of devices or the right valve, especially in parenteral drug abusers. It has only occasionally been described in the setting of left endocarditis, generally associated with a predisposing congenital heart disease and possibility of left–right shunt. The main debate around the treatment of this patient concerned the indication of surgery, especially after the onset of fever with splenic territory and lung parenchyma, giving rise to haemoptysis as the first symptom.

Discussion

We describe the unusual clinical presentation of endocarditis on regurgitant bicuspid aortic valve and likely secondary manifestation on a perimembranous VSD as massive haemoptysis. Aortic valve infection spread through VSD towards its aneurysm. No direct involvement of the tricuspid valve leaflets was found. Vegetations embolized both systemic territory and lung parenchyma, suggesting splenic infarction (Figure 3). The echocardiogram at hospital discharge showed no vegetation masses on the aortic valve or VSD (Figures 4–6). Moderate–severe aortic insufficiency was recorded, attributable to a similar leaflet prolapse to that observed before hospital admission.

Magnetic resonance imaging was performed to evaluate the deafness episode; with non-conclusive findings but a suspicion that the deafness was secondary to septic embolisms. No cerebral embolisms were documented.

At 9 months post-discharge, the patient was asymptomatic and continued with his regular follow-up programme. No other discrepancies with previous imaging studies were observed. An echocardiogram showed that vegetations on the aortic valve had disappeared and there were no signs of infection progression.

After hospital admission, he received gentamycin combined with ceftriaxone for the first 2 weeks (see Supplementary material online, Video 6) and this treatment was then combined with penicillin, due to onset of a ceftriaxone-related pruriginous skin rash. The treatment was maintained for 4 weeks after the first day of negative blood cultures, hence, it was administered for a total of 35 days.

During his hospital stay and under this antibiotic treatment, he reported abdominal pain and developed a self-limiting fever. Computed tomography examination showed a hypodense splenic area in the portal phase, of triangular shape with peripheral base and apex towards the splenic hilum, suggesting splenic infarction (Figure 3). The echocardiogram at hospital discharge showed no vegetation masses on the aortic valve or VSD (Figures 4–6). Moderate–severe aortic insufficiency was recorded, attributable to a similar leaflet prolapse to that observed before hospital admission.

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septic embolism while under appropriate antibiotic treatment. Current endocarditis guidelines recommend surgery for left endocarditis in three situations:

1. Heart failure.
2. Uncontrolled infection.
3. Prevention of embolism:
   a. Persistent vegetations >10 mm after one or two embolic episodes despite appropriate antibiotic treatment. (I)
   b. Mitral or aortic vegetations >10 mm with stenosis or severe regurgitation, with low surgical risk. (IIa)
   c. Very large mitral or aortic vegetations (>30 mm). (IIa)
   d. Mitral or aortic vegetations >15 mm. (IIb)

Our patient had fever associated with a septic splenic embolism more than 1 week after the initiation of antibiotic treatment. He was stable, with no signs of heart failure. Therefore, a surgical indication was supported by the presence of persistent fever and the embolization despite the antibiotic treatment. However, a repeated echocardiogram after the septic splenic embolism showed no residual vegetations on the aortic valve or VSD and a TEE study ruled out a local complication.
the multidisciplinary team advised to refrain from surgery, which was associated with high morbidity and mortality, and to focus on optimal pharmacological management, considering the local infection and the embolism were controlled under medical treatment. The patient was completely asymptomatic after the embolic event, with no signs of persistent infection, ruling out the need for emergency surgery. After stabilization of the symptoms, he showed a VSD with borderline Qp/Qs (1.6) and severe but asymptomatic aortic regurgitation with normal ventricular...
function. The Qp/Qs cannot be accurately accessed in the setting of moderate aortic regurgitation. The possibility of successful valve repair appeared slim. Because of his young age there was a high probability of replacement by a mechanical prosthesis when chronic anticoagulation would be necessary. Given these circumstances (left ventricular end-systolic diameter <50 mm and ejection fraction >50%), the heart team elected a clinical and imaging follow-up was approach.

The patient therefore continued with the antibiotic treatment and close echocardiography follow-up. He remained completely asymptomatic at 6 months and 1 year after the infectious event and was leading an active life with moderate regular exercise.

Conclusions

Haemoptysis is a rare symptom associated with endocarditis and is an exceptional finding in the setting of left-sided endocarditis and a VSD. Diagnostic suspicion is raised by the presence of a predisposing heart disease that can explain the symptoms such as congenital heart disease with the possibility of a left-to-right shunt.

Lead author biography

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Supplementary material

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

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Slide sets: A fully edited slide set detailing this case and suitable for local presentation is available online as Supplementary data.

Consent: The authors confirm that written consent for submission and publication of this case report including images and associated text has been obtained from the patient in line with COPE guidance.

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