

Early Prosthetic Valve Endocarditis with Mycobacterium Tuberculosis after Mitral Valve Replacement: A Case Report

Papa Amath Diagne*, Mory Camara, Papa Ousmane Ba, Momar Sokhna Diop, Moussa Samba, Abdou Lahad Mbengue, Jean Claude Ndiogou Dione, Myriam Bizrane, Marième Soda Mbaye, Moussa Seck Diop, Toudiani Malam Kaka, Papa Salmane Ba, Papa Adama Dieng, Amadou Gabriel Ciss, Assane Ndiaye

Cardiovascular and Thoracic Surgery Department, FANN National University Hospital, Dakar, Senegal
Email: *diagnepapaamath@gmail.com

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Abstract

Background: Tuberculous endocarditis is a rare but serious complication of heart valve replacement surgery. We report the case of a 24-year-old patient, who presented with tuberculous endocarditis after mechanical mitral valve replacement, with a favorable clinical course following anti-tuberculosis treatment. **Case Presentation:** We report a 24-year-old male patient, admitted to the cardiac surgery department of the Fann Hospital (Dakar, Senegal), for the management of severe mixed (rheumatic and endocarditic) mitral insufficiency with associated tricuspid insufficiency. He had a history of recurrent angina and polyarthralgia in childhood, was hospitalized several times for refractory global cardiac decompensation, and for a suspected infective endocarditis a month before his admission. On admission, the clinical examination revealed signs suggestive of mitral and tricuspid insufficiency. Transthoracic echocardiography revealed severe post-endocarditic mitral insufficiency with A3 amputation, highly mobile 15 mm vegetations on the free edge of the large valve, moderate tricuspid insufficiency, and severe pulmonary artery hypertension. Mechanical mitral valve replacement and tricuspid valve annuloplasty using autologous pericardial strip were performed via median sternotomy. After ten days, the patient presented with global cardiac decompensation associated with a clinico-biological infectious syndrome, and trans-oesophageal echography revealed an abscess at the sinotubular junction, communicating with the aorta. A thoraco-abdomino-pelvic CT scan was done, which revealed a bilateral alveolar-interstitial syndrome with mediastinal lymphadenopathy. Anti-tuberculosis treatment with RHZE was initiated for 06 months. The clinical course was favorable. **Conclusion:** Tuberculous

endocarditis in prostheses is a serious complication of heart valve replacement surgery, which may evolve favorably under medical treatment.

Keywords

Tuberculous Endocarditis, Prosthetic Valve Endocarditis, Mycobacterium Tuberculosis

1. Introduction

Early endocarditis on prosthetic heart valves is a redoutable complication of heart valve replacement surgery [1]. Diagnosis and optimal therapeutic strategy remain challenging. The most common causal organisms are oral streptococci and *Staphylococcus Aureus* [1], Prosthetic valve tuberculous endocarditis is rare but has been described in the literature [2]. We report the case of a 24-year-old patient, who presented with tuberculous endocarditis after mechanical mitral valve replacement, with a favorable clinical course following anti-tuberculosis treatment.

2. Case Presentation

A 24-year-old male patient, admitted to the cardiac surgery department of the Fann Hospital (Dakar, Senegal), for the management of severe mixed (rheumatic and endocarditic) mitral insufficiency with associated tricuspid insufficiency. He had a history of recurrent angina and polyarthralgia in childhood, was hospitalized several times for refractory global cardiac decompensation, and also for a suspected infective endocarditis a month before his admission. He had empirical antibiotic therapy (as culture results weren't available at the time) with a favorable evolution. On admission, he had NYHA stage III dyspnea, associated with a productive cough and whitish sputum.

The clinical examination revealed a good general condition (Temperature 37.7°C, Pulse 113 bpm, blood pressure 110/70 mmHg, Respiratory frequency 20 cpm, Weight 51 kg) with no signs of peripheral cardiac congestion with signs suggestive of mitral and tricuspid insufficiency. The pleuropulmonary examination was unremarkable. Transthoracic echocardiography revealed severe post-endocarditic mitral insufficiency with A3 amputation (vena contracta 6.9, Regurgitation orifice surface 1.2 cm², Volume regurgitated 139 ml) with eccentric jet directed towards the posterior wall on a non-dilated mitral annulus. A highly mobile 15 mm vegetations on the free edge of the large valve. A moderate tricuspid insufficiency (right atrial pressure at 15 mmHg with a tricuspid annulus at 49 mm), and severe pulmonary artery hypertension (Systemic pulmonary arterial pressure 81 mmHg). Remodelled aortic leaflets, thickened at the edges. There was no significant aortic regurgitation. The right and left atria were moderately dilated. Left ventricular ejection fraction was 65% and Tricuspid annular plane

systolic excursion 19 mm.

The biology showed white blood cells at $9200/\text{mm}^3$, haemoglobin 12.3 g/dl, haematocrit 38.2%, platelets 259.000, CRP negative, Normal liver and kidney function tests. Tuberculosis tests (Intra Dermal Tuberculin Reaction, sputum acid-alcohol-fast bacilli and GenXpert) were negative. ENT and stomatological examinations did not reveal any infectious sites.

The indication for mechanical valve replacement associated with tricuspid plasty has been established. It was performed by vertical median sternotomy under extracorporeal circulation with aorto-bicaval cannulation and anterograde cardioplegia with a DelNido solution. The mitral valve was approached directly through the left atrium. It showed a thickened, remodelled anterior valve with 15 mm of calcified vegetation at the free edge of the A2 with restriction of the posterior valve and a moderately affected subvalvular apparatus. He had a bloc excision of the mitral valve and replacement with an implanted CARBOMEDICS STANDARD size N°29 along with tricuspid valve annuloplasty using autologous pericardial strip. Extracorporeal circulation time was 103 min and aortic clamping time 83 min. The native valve was sent for bacteriological analysis, in particular for Mycobacterium Tuberculosis. The post-operative course was straightforward, with cardiac ultrasound on the 6th day showing a functional mitral prosthesis that was not leaky or stenosing (Average gradient 6 mmHg), non-stenosing tricuspid plasty with minimal leakage (Right ventricular gradient/Right auricle 27 mmHg), mean systolic dysfunction of the left ventricle 43%, severe right ventricular systolic dysfunction (TAPSE 9 mm) and moderate pulmonary hypertension at 42 mmHg. On discharge at Day 9 after achieving her target INR, her treatment consisted of Converting enzyme inhibitors, Phosphodiesterase inhibitor, oral Anticoagulation, Diuretic, Antalgic.

He was readmitted on post-operative Day 10 on account of global cardiac decompensation. The clinical examination at presentation revealed a good general condition. His vital signs were: Blood Pressure 100/60 mmHg, Temperature 38.7°C , Pulse 144 bpm. The systemic examination revealed signs of right heart failure (distended jugular veins, hepatomegaly, bilateral lower limb edema), a mitral prosthetic click and rales in both lung bases. The laboratory work-up performed at admission showed a normal white blood cell count ($5170/\text{mm}^3$), anemia with a hemoglobin level of 10.3 g/dl, and an increase in CRP to 42.4 mg/dl. Urine microscopy, culture and blood cultures were negative. Transthoracic echocardiography revealed the presence of filiform vegetations on the ventricular aspect of the mitral valve prosthesis and an abscess at the aortic level. Transesophageal ultrasound (TOE) revealed an abscess at the sinotubular junction, communicating with the aorta with color Doppler. The diagnosis of early prosthetic valve endocarditis was made and dual empirical antibiotic therapy was initiated. Initially based on Vancomycin (500 mg \times 3/day) and Gentamycin (160 mg/day) then secondarily based on Vancomycin (500 mg \times 3/day) and Imipenem (500 mg \times 3/day). During this period, there was persistence of tempera-

ture spikes and features of the systemic inflammatory response syndrome (CRP at 38.4 mg/dl). Blood cultures were negative. On postoperative day 21, whilst still on admission he developed rhythm anomalies such as ventricular fibrillation which required electrical cardioversion (2 external electric shocks of 200 joules) and initiation of amiodarone 200 mg/day. Given the persistence of the systemic inflammatory response syndrome and the arrhythmia (at least 10 episodes of ventricular fibrillation) after 43 days of antibiotic therapy and, being in a tuberculous endemic area, a thoraco-abdomino-pelvic CT scan was done. He revealed a bilateral alveolar-interstitial syndrome with mediastinal lymphadenopathy. The diagnosis of multifocal tuberculosis (pleuro-pulmonary, lymph node, and endocardial foci) was made. Anti-tuberculosis treatment with RHZE (Isoniazid 5 mg/kg/day, Rifampicin 15 mg/kg/day, Ethambutol 20 mg/kg/day, Pyrazinamide 35 mg/kg/day) was initiated for 06 months (2 months RHZE + 4 months RH). He had a favorable clinical progress with a stable afebrile (after 2 days of anti-tuberculosis) and a clear regression of markers of inflammation (CRP = 24 mg/dl). He was discharged on Day 10 of the initiation of anti-tuberculosis drugs with a favorable clinical course. Transthoracic echocardiography at the out-patient clinic one-year after surgery was normal with no evidence of infective endocarditis.

During follow-up, he underwent liver function tests (before starting treatment, then every month for 6 months) and monitoring of oral anticoagulation with regular INR measurements at least once a month (particularly because of the risk of interaction with anti-tuberculosis drugs). During the 6 months of anti-tuberculosis treatment, the patient presented no hepatic, hemorrhagic or thrombo-embolic complications.

3. Discussion

Prosthetic valve endocarditis (PVE) is associated with high mortality during early and medium-term follow-up despite diagnostic and therapeutic improvements; its incidence is rising, reaching 20% - 30% of all episodes of infective endocarditis [2].

Tuberculous endocarditis is rare and occurs in most cases, on native valves [3]. However, infection of prosthetic heart valves, especially mechanical prostheses, caused by *M. tuberculosis* has rarely been reported [2]. The genus *Mycobacterium* belongs to the order Actinomycetales and includes more than 130 distinct species. The Latin prefix “myco” refers to waxy compounds that are part of their characteristic lipid structure, which make up part of their lipid-rich and thick cell walls. These organisms resist decolorization with acidified alcohol after being stained with carbolfuchsin, a property conferred on them by the presence of mycolic acid in their cell wall, hence the designation of acid-alcohol-fast bacilli [4].

We report a rare case of tuberculous endocarditis in a mitral mechanical valve. The indication for surgery was symptomatic severe endocardial mitral in-

sufficiency. We opted for a mechanical valve because of the patient's young age (24), since in our context of a developing country it is financially difficult for patients who have benefited from a first operation with a biological valve to undergo re-operation later. After informed consent, the patient opted for a mechanical prosthesis. Autologous pericardial strip tricuspid reconstruction is also performed in our center for financial reasons, due to the additional cost of a tricuspid ring. No prior antibiotic prophylaxis was given in the absence of any clinical or paraclinical evidence (apart from vegetation) of overt infection. Prosthetic endocarditis is defined as an infection occurring on a prosthetic heart valve [1]. It occurs in 1% to 6% of patients with prosthetic valves, its incidence is 3 to 12 per 1000 patient-years [5]. Based on different microbiological profiles, we classically distinguish early prosthetic valve infective endocarditis (IE), as one which occurs within one year after surgery, and late-onset IE as that occurring beyond one year [5]. The history of native valve endocarditis, whether active or not, is an important risk factor for the occurrence of prosthetic valve endocarditis [2], as in our patient. In our patient, we also have other associated risk factors, such as male sex, black race, and mechanical prosthetic valve.

The most common clinical presentations of prosthetic valve endocarditis are persistent fever after valve replacement, profound anorexia, change in the character of a murmur, conduction disorders, congestive heart failure, and embolic events [1]. In our case, we found a fever after mechanical mitral valve replacement and right heart failure. Diagnosis is based on several blood cultures performed before the start of antibiotic therapy [1].

Blood cultures are often negative if performed after the start of antibiotic therapy. They can also be negative when endocarditis is linked to intracellular microbes (HACEK group, *Coxiella burnetii*, *Bartonella* spp., *Chlamydia* spp., and *Brucella* spp.) [2] or when it is bound to a microbe requiring culture on a specific medium, as is the case of *Mycobacterium*. The mycobacterial species most frequently involved belong to the fast-growing group (*M. chelonae*, *M. fortuitum* and *M. abscessus*) of non-tuberculous mycobacteria (NTM). The source of infection in this context would be nosocomial, probably linked to preoperative or intraoperative contamination of the prosthesis by contact with aqueous solutions containing the organisms. These infections are difficult to diagnose, as blood cultures are often negative [4].

The etiological infectious agents of prosthetic endocarditis are very different from those of infective endocarditis on native valves because nosocomial infections have become the main predisposing factor for endocarditis on prostheses, especially when it occurs within 60 days of valve surgery [4]. Organisms can reach the prosthetic site either by direct contamination during the procedure or by hematogenous route. In the medical literature, reported cases of tuberculous endocarditis on prosthesis occur in the context of miliary tuberculosis such as is the case in our patient.

SM Yuan's study of 50 patients with mycobacterial endocarditis also found a young age profile, with an average age of 45.9 years. Fever was present in clini-

cally, it is important to recognize the possibility of NTM-PVE in the differential diagnosis of culture-negative patients who develop signs and symptoms of endocarditis, whether they present early or late after surgery. These patients should be treated by surgical removal of the infected valve, followed by appropriate antimicrobial therapy based on the susceptibility of the species isolated from the valve or perivalvular tissue culture [3]. The post-operative period was marked by fever in 76.1% of cases, and mean CRP was 6.8 mg/dl. Heart valve surgery was performed in 23 patients, 22 of whom underwent heart valve replacement (with biological valves in 80% of cases). Diagnosis was early (before 8 weeks) in 29% of cases and late (after 8 months) in 64.5%. Bioprosthetic valve endocarditis was associated with a longer latency than mechanical endocarditis, with no significant difference (17.5 months vs. 10.8 months) [3].

The case of Q Liu shows a 32-year-old man who presented 9 years after a Bentall procedure for congenital heart disease with recurrent fever and weight loss. [6].

Echocardiography is an essential tool in the diagnosis and management of infective endocarditis, especially when it occurs on prosthetic valves [2]. It is even more important in the case of endocarditis with negative blood cultures. Transesophageal echocardiography has a greater sensitivity and specificity than transthoracic echocardiography both in the detection of endocarditis stigmata on the prosthetic valve and in the detection of its complications such as abscesses, fistulas, perforations, periprosthetic leaks and valve disinsertions [2]. In our case, the trans-thoracic echocardiography detected the presence of vegetations and a detergent abscess that trans-esophageal echocardiography confirmed. This abscess explains the occurrence of rhythm disorders. The case of Q Liu shows a paravalvular abscess in the mechanical aortic valve on TTE, with CT evidence of pulmonary TB [6]. In SM Yuan's study [3], vegetations were detected on TTE in 86% of patients, in 1 patient the diagnosis was made on PET-scan, and only 1 patient had an abscess.

The gold standard for diagnosis remains the detection of the pathogen, after culture of infected tissues taken during surgical revision [2]. In our case, all analyses in search of *Mycobacterium tuberculosis* were negative. SM Yuan shows a positive culture (after additional tests) in 44% of patients tested, with BAARs present in 4% of cases [3].

In our patient, the diagnosis was based on several factors (the presence of endocarditis stigmata on TOE, the persistence of the systemic inflammatory response syndrome despite empirical dual antibiotic therapy, and the presence of CT images in favor of pulmonary tuberculosis). The valve culture came back negative, whereas removed valve prostheses often show a high positivity of mycobacterial cultures [3].

In the medical literature, the treatment of most cases of tuberculous endocarditis was based on surgical intervention combined with anti-tuberculosis drugs [6]. The duration of anti-tuberculosis treatment in most cases reported in the literature is on average 9 to 12 months [6]. In our patient, we have instituted

treatment for a period of 6 months, which is the period recommended by our health authorities for pulmonary tuberculosis and the evolution was favorable after 2 weeks of treatment.

Common indications for surgical intervention for prosthetic valve endocarditis are the presence of congestive heart failure, uncontrolled infection or to prevent embolism [2]. Despite a higher mortality rate for surgery for prosthetic valve endocarditis than for native valve endocarditis, there has been a reported better prognosis of medical-surgical treatment of prosthetic valve endocarditis compared to medical treatment alone [2]. Surgical indications for endocarditis on prosthesis are as follows [2]:

- 1) Early or late prosthesis endocarditis with severe prosthetic dysfunction or fistulas causing pulmonary edema.
- 2) Severe conduction abnormalities,
- 3) Persistent fever and positive blood cultures,
- 4) Staphylococcal or gram-negative bacterial infections,
- 5) Infections with fungal or multidrug-resistant organisms,
- 6) Abscess formation,
- 7) Bulky vegetation (>10 mm) on prosthetic valves of the left heart,
- 8) Mechanical obstruction of the prosthetic valve,
- 9) Recurrent embolism despite medical treatment.

Our patient had two: uncontrolled infection and the presence of abscesses. Due to their greater resistance to antimicrobial therapies than other pathogens, mycobacteria are often refractory to antimicrobial treatments. Patients with deep infections of fast-growing mycobacteria often warrant surgical intervention, including removal of the line, debridement, or removal of the foreign body [4].

But the favorable evolution of our patient following anti-tuberculosis treatment may suggest (for mycobacteriums) a reconsideration of the assertion that medical treatment alone, is often disappointing in patients with early prosthetic valve IE with abscess formation [3]. In SM Yuan's study, all patients were put on specific antibiotic treatment and after a follow-up of 48.7 months, half of the patients survived without event and 34% died [4].

In endemic areas, it would be advisable to carry out tests for *Mycobacterium tuberculosis* prior to any cardiac surgery, in the presence of a range of clinical and/or paraclinical arguments, to initiate medical treatment before surgery.

4. Conclusion

Early prosthetic valve IE is a severe complication of valve replacement surgery with a poor prognosis. Tuberculous endocarditis is rare, but it should be thought about, especially in tuberculosis-endemic areas and when blood cultures are negative. Anti-tuberculosis treatment alone can bring good results.

Patient Consent

The patient gave his consent to use his data.

Conflict of Interest Statement

The authors declare that they have no competing interests.

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