

Surgical Management of Mitral Valve Infective Endocarditis with Accidental Finding of Open Pulmonary Tuberculosis

Ahmad Al Khaddour, Mohammed Alharthi, Alawab M. Mesallam, Mohamed Agawi, Mahmoud Ghalwash, Ahmed Gotbi, Mohamed Abdel Hafez Fouly, Marko Samanovic, Nelson David Vega, Murad El Gharbi, Fawaz Altaf

King Abdullah Medical Complex, Jeddah, KSA

Email: ahmedal@doctors.org.uk

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Abstract

Objective: This case report aimed to highlight intersections of TB and Cardiovascular diseases which carry high morbidity and mortality rates. **Methods:** We are reporting the surgical management of forty seven years female who had back ground history of IDDM (Insulin dependent diabetic Mellitus), ESRD (End stage renal disease) on HD (haemodialysis) also she had left subclavian artery stenosis, and paroxysmal atrial fibrillation. She was diagnosed with mitral valve infective endocarditis and found accidentally to have an open pulmonary tuberculosis (TB) on the day before surgery. **Results:** She was started on first line anti-TB treatment. She was isolated in her private room and airborne precautions measures applied. The patient underwent a tissue Mitral Valve replacement and tricuspid valve repair annuloplasty. Special precautions were applied in Theatre and on cardiopulmonary bypass Machine guided by KAMC-J disinfection protocol. The patient made good recovery postoperatively. She was discharged well on day 7 post operatively. **Conclusion:** Intersections of TB and cardiovascular diseases carry high morbidity and mortality rates. Early diagnosis and early anti tuberculosis treatment can surely improve the patient prognosis. Our decontamination and disinfective procedures are recommended. Cases like this should be monitored long term for the development of further cardiovascular complication.

Keywords

Tuberculosis (TB), *Mycobacterium tuberculosis* (MTB), Heater-Cooler and Bypass Machine, New York Heart Association (NYHA)

1. Introduction

Tuberculosis (TB) is a dominant cause of death in developing countries. It has been a public health emergency for decades. The disease process, which is caused by *Mycobacterium tuberculosis* (MTB) affects the respiratory system as well as many other organ systems in the body such as the lymphatic system, central nervous system, gastrointestinal system, and cardiovascular system (CVS) [1].

Generally Cardiovascular disease is the leading cause of death worldwide [1], also the mortality rate of tuberculosis (TB) in developing country is high [2] and this make the mortality of TB with sick heart condition exceptionally high. Many studies showed that latent tuberculosis increased the risk of myocardial infarction and Coronary heart disease [1]. The multisystemic involvement of TB impacts the cardiovascular system in various form [1]. While pericarditis caused by TB is quite common, other complications like myocarditis, coronary artery disease, and aortitis are rarer, necessitating a high index of suspicion and holistic management. We are reporting the surgical management of forty seven years female who was diagnosed with mitral valve infective endocarditis and found accidentally to have an open pulmonary tuberculosis (TB). In addition to this we are highlighting the decontamination and airborne precaution measures we applied.

2. Case Presentation

A 47-year-old female was admitted to our hospital through an emergency department with increasing breathlessness (NYHA III-IV during her admission she had two episodes of Haemoptysis. The patient's past medical history include IDDM (Insulin dependent diabetic Mellitus), ESRD (End stage renal disease) on HD (haemodialysis) through left arm arterial venous fistula, also she had left subclavian artery stenosis, and paroxysmal atrial fibrillation. The patient had no allergy. Preoperative investigations were done, she was found to have bicytopenia, Anaemia HB 7 g/dl, and thrombocytopenia, platelets $39 \times 10^3/\text{ul}$. With creatinine value of 498 $\mu\text{mol/L}$, Bun 12.5 mmol/L the chest X ray was very congested with bilateral pleural effusion (Figure 1).

Echocardiogram showed that she had a large mobile vegetation 1.5×0.7 cm attached to atrial side of the anterior leaflet of the mitral valve (Figure 2) with a severe mitral regurgitation by colour Doppler (Figure 3). Tricuspid valve was normal with moderate to severe regurgitation. pulmonary artery systolic pressure was raised at 50 - 55 mmHg. Ct Chest, Abdomen and pelvis showed evidence of splenic infarction. Blood culture confirmed *Enterococcus faecalis*. The working diagnosis was infective endocarditis on the mitral valve with evidence of splenic infarct. General surgeon s were consulted with regard the splenic infarction and advised for conservative management only. Patient received appropriate intravenous antibiotic directed by microbiology advice for three weeks preoperatively. Patient continued to receive CVVH (continuous venous venous Haemodialysis). She was treated also with chest physio and CPAP (continuous

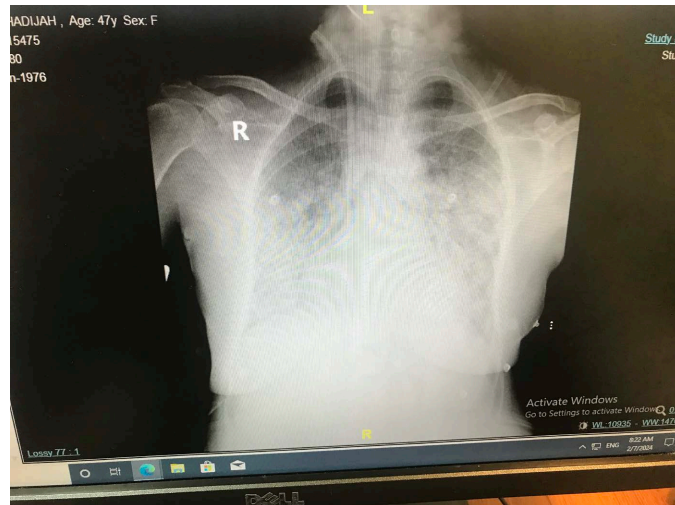


Figure 1. CXR preoperatively showing pulmonary oedema with bilateral effusion.

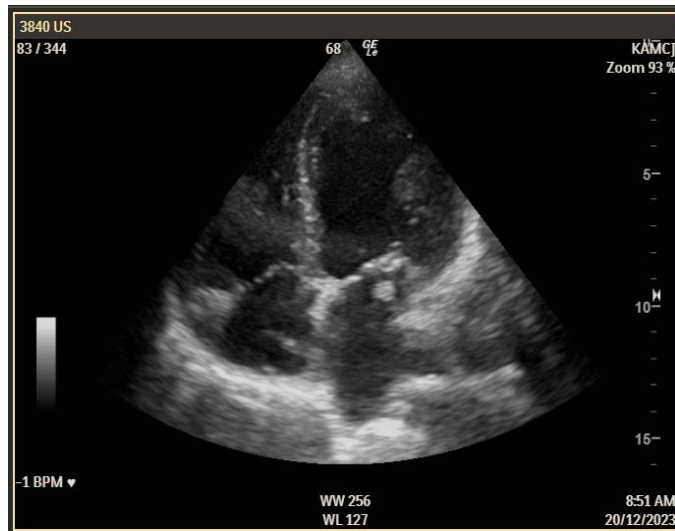


Figure 2. Transthoracic echo before the operation showing a mobile large vegetation on the atrial side of the mitral valve.

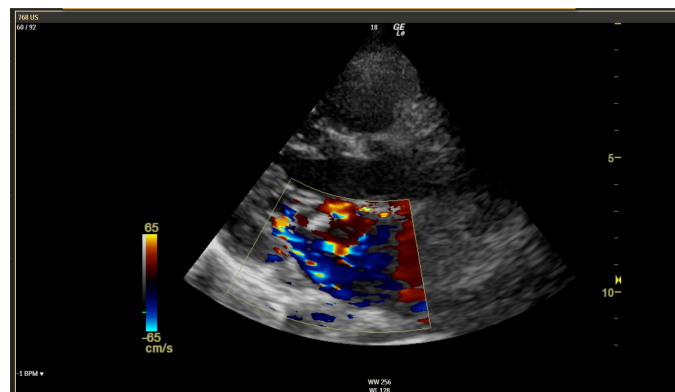


Figure 3. Transthoracic echo before the operation showing significant mitral regurgitation by colour Doppler.

positive airway pressure). Also the patient received blood and platelet transfusion, HB optimised to 8.2 g/dl and platelet optimised to $70 \times 10^3/\text{ul}$ preoperatively.

Based on the CT chest and CXR, PCR test on sputum was sent and confirmed Tuberculosis (TB) on the night before surgery. Therefore she was started on first line anti-TB treatment Isoniazide, Ethambutol, Ethionamide, Rifampicine and levofloxacin. She was isolated in her private room and airborne precautions measures applied. The patient underwent a tissue Mitral Valve replacement, size 25 (Mosiatic) and tricuspid valve repair annuloplasty Size 28 (contour 3D). Special precautions were applied in Theatre and on cardiopulmonary bypass machine. Personal protective equipment (PPE) was used to ensure the safety of all professional associated personnel participating in the operation. The ventilation circuit was discarded post operatively and the theatre was disinfected according to KAMC-J disinfection protocol.

With regard Cardiopulmonary Bypass Circuit, We used The LivaNova S5 standard system and heater-cooler units (HCUS) were utilized in this procedure, with additional measures implemented to minimize the microbial load and ensure personnel protection during the operation. The Heater-Cooler System 3T includes three different water tanks, which were primarily utilized to adjust the patient's temperature. The water pipes were connected to an oxygenator to facilitate cooling. The oxygenator was equipped with a gas outlet port. Which we then connected via a drive suction tubing to a vacuum assist device set at (-40) pressure that connected to the gas panel wall. This setup was designed in-house to effectively remove exhaled mixed gases from the exchange within the oxygenator. Thereby, ensuring the safety of the operating theatre and the perfusionist who might be exposed to the outlet gases. This aims to provide a clearer understanding of the measures implemented to safeguard the operating environment and the individuals involved in the procedure.

Furthermore water pollution within the heater-cooler system was considered a high-risk source of infection therefore the internal tubing were eliminated and sterilized weekly with a decontamination regimen via peracetic acid [3] Personal protective equipment (PPE), were used as per Airborne Precautions Procedures [4]. Gloves (as needed), Gown (as needed), Respirator (All The Times) and Eye protection (as needed). Patient was kept in a private room with closed door and negative pressure Air exchange (6 - 12 air change/per hour) monitored and checked daily [4]. Temperature was kept ay 22 - 24 degree Celsius and Humidity was kept at 30% - 70%. With regard airborne precautions procedures [4]. All Health care workers and visitors do the following: Before patient room entry: Practice hand hygiene, Wear N95 respirator. Before exit from room: personal protective equipment must be removed except N95 respirator and discarded as medical waste. After exit from patient room: Remove N95 respirator and discarded as medical waste, practice hand hygiene. With regard Transportation: Notify the receiving unit/ward/department about diagnosis, Type of isolation precautions. Prepare the patient for transportation: Patient should wear surgical mask, Educate the patient about respiratory hygiene, Health care worker should

perform hand hygiene after patient transport. Health workers should wear the fitted N95 respirator. The patient bed/wheeled chair should be disinfected by locally approved. The patient should stay in a private room and the room door should be kept closed.

Postoperatively the patient made a good recovery. Initially she was on inotropic support which were wean down gradually, also she received blood and blood products and platelet. She was continued to receive CVVH. Postoperatively she developed some liver impairment therefore her anti TB medications were adjusted to second line of Ethambutol, Isoniazide and Ethionamide. Her liver function tests were improved and she was discharged well on day 7 post operatively. Her chest X ray post operatively was much improved (**Figure 4**). Her Transthoracic Echo postoperatively showing well-functioning mitral valve prosthesis (**Figure 5**). A month later, she underwent Venoplasty for her left subclavian stenosis.

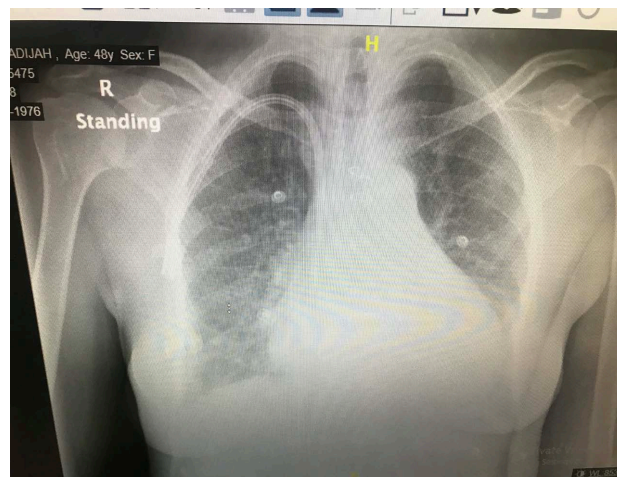


Figure 4. CXR Postoperatively showing resolution of pulmonary oedema with expanded lungs.

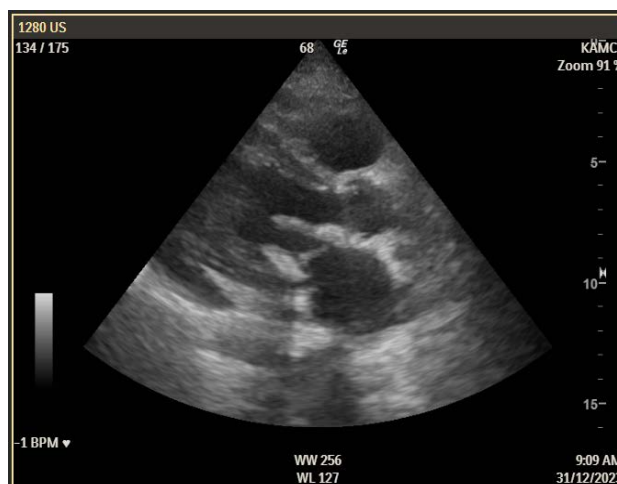


Figure 5. Transthoracic Echo postoperatively showing the new tissue mitral valve.

3. Discussion

According to the world health organization (who), Global Tuberculosis report, 909 million people were infected with TB in 2021, with 1.3 million people dying which is 13% of the total number infected. Although there has been a significant reduction in TB-related mortality over the last three decades due to improvements in antimicrobial and public health measures, current figures are still alarming and better control measures need to be implemented [2]. The multi-system involvement of TB impacts the cardiovascular system in various forms. While pericarditis caused by TB is quite common other complications like myocarditis, coronary artery disease and aortitis are rare necessitating high index of suspicion and holistic management [1]. Mortality Rates of those with Cardiovascular disease involvement with TB approach 60% [5]. Yuan *et al.* [6] revealed in this review paper of sternal wound tuberculosis following cardiac operation that patients with sternal tuberculosis infection had a significantly higher mortality than patient with sternal non-tuberculosis infection (29.2% VS 0%; $P = 0.051$). Molecular mimicry and autoimmunity are other critical components hypothesized in the pathophysiology of cardiovascular complications in TB. This involves the heat shock protein (HSP) system. About 40% - 50% of residues in human HSP65 and MTBHSP65 are identical. Thus, exposure to infection or other stressors induces expression of HSP65 on the surface of endothelial cells, and this results in a cross-reaction between antibodies produced against MTB HSP65 and self-HSP60 in the host [7]. We reported in this case a 47-year-old female who was diagnosed of infective endocarditis on the Mitral valve and then she was found accidentally to have an open pulmonary TB. In our case we tried to shed light on the intersection of two highly significant cause of mortality TB and Cardiovascular disease. As the patient was not reliable with the use of anticoagulation we decided to give her a tissue valve. The patient found to have an open TB in Sputum on the night before surgery and TB treatment was commenced promptly. We hypothesized that the autoimmune reaction associated with her latent TB caused her an endothelial injury on the mitral valve leaflet which made her amenable to catch the infection.

The use of cardiopulmonary bypass in the presence of active TB has not been reported previously. We reported the techniques we used during the bypass time intraoperatively to prevent the spread of the infection to the operating team. Additionally the patient did not show any clinical picture of TB flare up post operatively. As such the use of cardiopulmonary bypass in case of active TB patient can be done with precautions and can be tolerated clinically post op. Although this cannot be generalized as this is only a case report, further studies are recommended.

4. Conclusions

Cardiovascular diseases are the leading cause of death. Thus, intersections of TB and cardiovascular diseases carry high morbidity and mortality rates and this

should be closely examined. Inflammation process and immunological activation associated with TB could drive the development of endothelium injury in the heart and inside the coronary artery. Early diagnosis and early anti tuberculosis treatment can surely improve the patient prognosis.

Decontamination procedures in theatre during the case and postoperatively including replacement of internal tubing of HCUS and discarding the ventilation circuit are quite crucial. Weekly water sample for microbiology is required to maintain the water quality within HCUS at an acceptable level. The use of cardiopulmonary bypass machine in the case of active TB does not cause a flare up of the disease this patient should be monitored long term for the development of further cardiovascular complication. Further studies are highly recommended.

Ethical Statement

This study was approved by KAMC review Board (Ref 324/D). Written informed consent was obtained from the patient.

Conflicts of Interest

The authors declared no potential conflicts of interest with respect to this case report, authorship, and/or publication of this article.

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