

Original Article

A Study of Unusual Pacemaker Infection by *Mycobacterium Tuberculosis* in Indian Patients

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Abstract

Background: The expanding clinical indications of cardiac rhythm management have led to an increased use of pacemaker implantation which is associated with increased incidence of pacemaker infections. *Staphylococcus aureus* and *epidermidis* account for the vast majority of pacemaker infections. Pacemaker infection due to *Mycobacterium tuberculosis* (*M. tuberculosis*) is very rare, only few cases having been reported till date.

Methods: We describe here a study of three patients of pacemaker pocket infection with *M. tuberculosis*.

Conclusion: The possibility of mycobacterial pacemaker infection should always be kept in mind in patients with delayed pacemaker infection.

Key words: *Mycobacterium tuberculosis*, Pacemaker Infection

Introduction

Pacemaker infections with *M. tuberculosis* are extremely rare. The reactivation of latent tuberculosis (TB) at sites affected by trauma or surgery has been described [1-3]. Mycobacterial infections may present many years after a procedure, often in a non-specific fashion and without any visible sign of infection. Doherty et al [4] described a case of a pacemaker pulse-generator pocket infection in a patient with military tuberculosis while Hellwig et al [5] reported a case of pacemaker infection with *M. tuberculosis* in an 8 year old patient. Another reported case of tubercular infection involving epicardial pacing wires suggests that placement of epicardial wires may be associated with reactivation of previously silent pericardial infection [6].

In our institute from January 2007 to December 2013 seven hundred and thirty two pacemakers were implanted. We describe here three cases of delayed pacemaker infection

(after one year) with *M. tuberculosis* in the absence of active pulmonary or disseminated disease, and review the literature of pacemaker infection by *Mycobacterium* species.

Case 1

A 48-year-old man underwent implantation of a dual chamber pacemaker for complete heart block. The patient was a heavy smoker and chronic alcoholic. After a symptom-free interval of 15 months, the patient was seen with a subcutaneous abscess of the pacemaker site that was not associated with any systemic symptom or sign of infection. He did not report any other symptoms. On physical examination a small soft tissue swelling was noted at the incision line of the pacemaker site. The swelling was erythematous, non tender and there was no wound dehiscence or pus discharge. Blood cell counts were normal and blood cultures remained sterile. He was treated empirically with intravenous ampicillin and amikacin. After five days of therapy the swelling did not subside and spontaneous pus discharge started. Pus was negative by gram stain, and bacterial culture was sterile but it was positive for acid fast bacilli (AFB). Diagnosis of *M. tuberculosis* was confirmed by polymerase chain reaction (PCR) assay. There was no radiographic evidence of pulmonary TB. A transthoracic echocardiogram showed no evidence of pericardial disease or any vegetation. He was initially treated with isoniazid (INH) 300 mg, rifampicin 450 mg, ethambutol 800 mg and pyrazinamide 1500 mg daily for 3 months followed by INH 300 mg and rifampicin 450 mg daily for another 9 months. Healing of the wound occurred within 14 days of starting therapy. He responded well to treatment. After a follow up of 3 years the patient is asymptomatic.

Case 2

A 70-year-old man presented with a subcutaneous abscess at the pacemaker site with pus discharge after 18 months of single chamber pacemaker implantation. Patient was a known diabetic for 20 years on oral anti-diabetic therapy with well controlled diabetes, and a heavy smoker. On physical examination a small soft tissue swelling was noted over the pacemaker site with pus discharge. Haematology and biochemical investigations were normal. After two blood culture samples were sterile, empirical intravenous amoxicillin and gentamycin were started and wound dressing was done with topical antibiotics. Pus was also sent for AFB staining which was negative, but PCR for *M. tuberculosis* was positive. Pacemaker pocket debridement and resuturing of wound was done. Tissue removed from the pocket during debridement was sent for histopathology which revealed granulomatous inflammation (**Figure 1**). The chest radiograph and echocardiography did not reveal any abnormality. He was initially treated for 3 months with isoniazid, rifampicin, ethambutol and pyrazinamide followed by isoniazid and rifampicin for another 9 months. After a follow up period of 3 years the patient is asymptomatic.

Case 3

A 71-year-old, non diabetic female underwent implantation of biventricular pacemaker for complete heart block and left ventricular dysfunction. The patient had been successfully treated for pulmonary tuberculosis 15 years back. After a symptom-free interval of 60 months after device implantation, the patient presented with a large lump over the pacemaker site. On physical examination a 10 x 10 cm soft tissue swelling was noted over the pacemaker site. The swelling was non tender, non erythematous and there was no pus discharge. Blood cultures were sterile. Blood cell counts were normal. Ultrasound revealed a large pus collection in the pacemaker pocket. Pus was drained and sent for microbiological analysis. Pus was negative by gram stain, and aerobic and anaerobic cultures were sterile. Pus was also negative for AFB but PCR for *M. tuberculosis* was positive. There was no evidence of active pulmonary or extrapulmonary tuberculosis and three sputum samples were negative for AFB.

The patient was started on quadruple treatment with rifampicin, isoniazid, ethambutol and pyrazinamide. Wound healing did not occur probably due to large size of swelling so the pacemaker device was explanted and patient was put on temporary pace maker. A new permanent pacemaker device was reimplanted at another site after 4 weeks of starting of ATT. The patient is now asymptomatic and presently continuing on ATT.

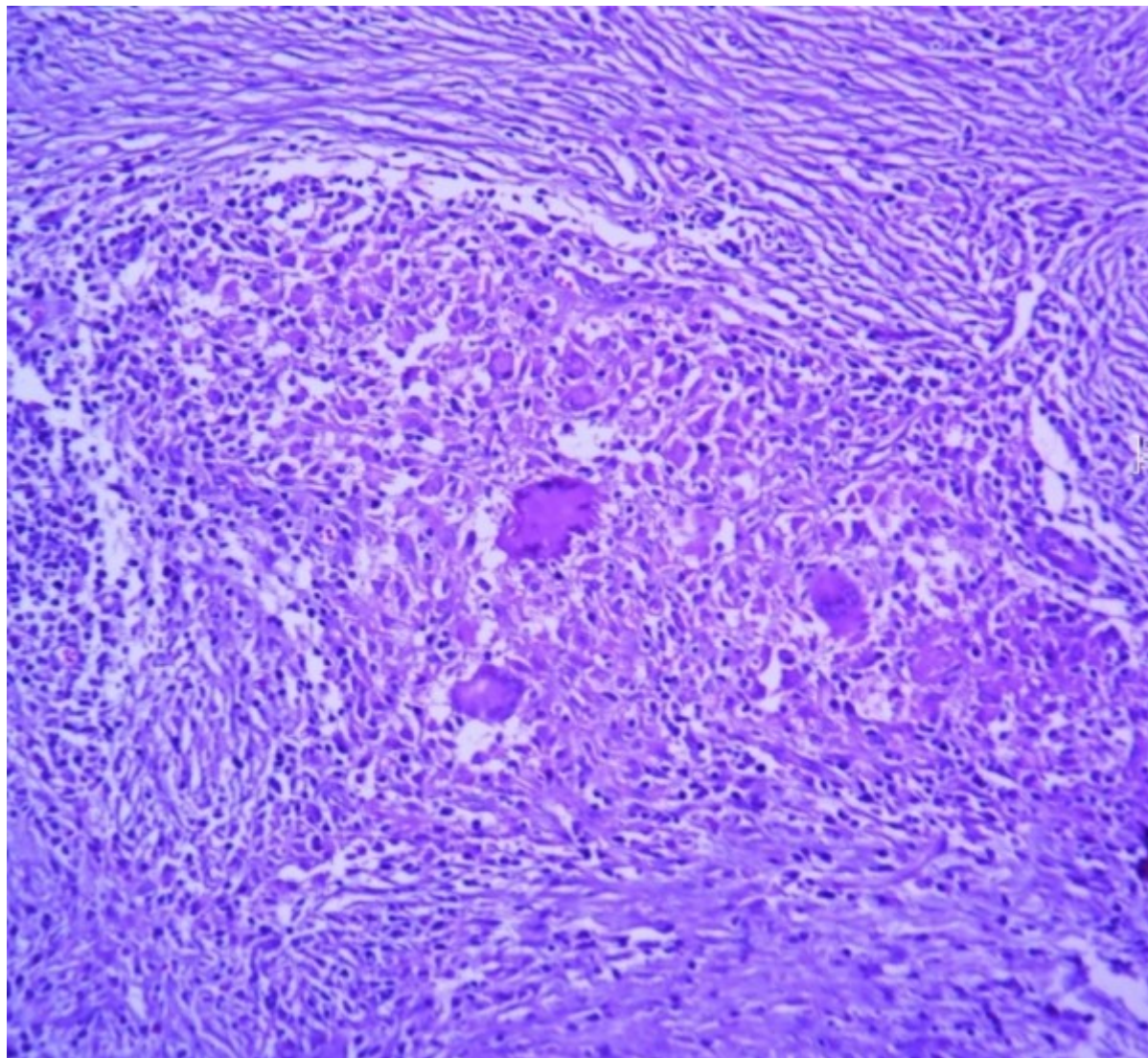


Figure 1: Microphotograph of H&E stained section of case 2 showing granuloma composed of epithelioid cells and Langhans giant cells.

Discussion

Very few case reports of *M. tuberculosis* pacing system infections exist in the literature. The first is an elderly patient who had undergone single chamber pacemaker implant 20 years previously, and presented with miliary tuberculosis involving the heart and pacemaker pocket [4]. The second is a child with congenital heart disease who had an implant of an epicardial pacemaker [5]. Several months later the patient presented with decreased general health and moderate fever associated with a lump at the pacemaker site. Complete drainage and surgical ablation of the pacemaker demonstrated acid-fast bacilli at microscopy, and PCR confirmed *M. tuberculosis* infection. The third case also occurred at the site of epicardial pacing wires, which had been placed 11 months previously during coronary artery bypass surgery [6]. Drainage of the associated abscess confirmed *M. tuberculosis* infection. In another case report [7] ICD was implanted in an elderly patient and after 6 months the patient presented

with pain and swelling around the ICD site. Pus was aspirated, microscopy and culture confirmed tuberculosis, the device was explanted and ATT started. Small number of cases of pacemaker infections associated with other mycobacterial species has also been reported including *Mycobacterium fortuitum*, *Mycobacterium abscessus*, *Mycobacterium chelonae* and *Mycobacterium avium* complex [8-13]. Reports of Mycobacterial infections are summarised in **Table 2**.

Table 1 summarizes the characteristics of the three cases.

Table1: Characteristics of patient population.

Profile	Case1	Case2	Case3
Age	48	70	71
Sex	Male	Male	Female
Pace maker	Dual chamber	Single chamber	Biventricular
Onset of symptoms after implantation	15 months	18 months	60 months
Presentation	Painless small swelling over pacemaker site	Painless swelling and pus discharge from pacemaker site	Painless huge swelling over pacemaker site
Risk factors diabetes mellitus	-	+	-
Alcoholism	+	+	-
Smoking	+	+	-
Past/family history of tuberculosis	-	-	+
AFB stain of pus	+	-	-
PCR for <i>Mycobacterium tuberculosis</i>	+	+	+
Culture for <i>Mycobacterium tuberculosis</i>	+	-	-
Histopathology	-	Granulomatous inflammation.	-
Treatment	ATT completed for 1 yr	ATT completed for 1 yr	Ongoing ATT, Device extraction and later new device implantation done
Follow up	Asymptomatic after 3 yrs of completion of ATT	Asymptomatic after 3 yrs of completion of ATT	Asymptomatic after 10 weeks of ATT

Mycobacterium tuberculosis infection of pacemaker pocket is rare and the diagnosis is often delayed. None of our patients presented with constitutional symptoms and all were initially thought to represent bacterial wound infection. Tuberculosis was only considered when all investigations for bacterial infections were negative. It is important, however, for clinicians to be aware of the possibility of reactivation of tuberculosis after implantation in patients with a higher prevalence of latent infection, such as endemic countries like India or the elderly with compromised immune status like diabetes mellitus, alcoholism, HIV infection and on

immunosuppressive therapy. Mycobacterial infection can occur due to seeding of bacteria in the device pocket at the time of the procedure or due to haematogenous spread from foci from other site that subsequently remain clinically silent in the vicinity of the device for several months and later activate and cause florid infection. Diagnosis can be made by AFB staining, culture of pus, and PCR assay, and successfully treated with a combination of surgical debridement and antitubercular treatment for 9-15 months.

Table 2: Mycobacterial infections of implantable devices as reported in literature.

Year	age	Procedure	Organism	Outcome
1996 ⁴	70	Transvenous pacemaker	<i>M. tuberculosis</i>	Patient died of miliary tuberculosis
1998 ⁸	68	Epicardial pacemaker	<i>M. abscessus</i>	Device extracted, patient died
1998 ⁹	74	Pacemaker	<i>M. chelonae, M. fortuitum</i>	Device extracted, successful eradication
2004 ¹⁰	53	Transvenous ICD	<i>M. abscessus</i>	Device extracted, successful eradication
2005 ¹¹	62	Transvenous pacemaker	<i>M. fortuitum</i>	Device extraction, successful eradication
2005 ⁵	8	Epicardial pacemaker, congenital heart surgery	<i>M. tuberculosis</i>	Device extraction, successful eradication
2006 ¹²	80	Pacemaker	<i>M. fortuitum</i>	Device left in-situ, successful eradication with antimicrobial therapy
2007 ¹²	84	Revision of transvenous pacemaker	<i>M. fortuitum</i>	Device extraction, successful eradication
2009 ⁶	80	CABG surgery and epicardial pacing wires	<i>M. tuberculosis</i>	Drainage of abscess cavity
2010 ¹³	73	Pace maker	<i>M. phlei</i>	Device extraction, successful eradication
2010 ⁷	67	ICD	<i>M. tuberculosis</i>	Device extraction, successful eradication

Conclusion

We conclude that if a patient presents with delayed pacemaker infection and when Gram stain and routine cultures are negative then we should always think about the possibility of mycobacterial pacemaker infection.

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