

CASE REPORT

Surgical Extraction of a Huge Pacemaker Lead Vegetation causing Infective Endocarditis

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Abstract:

Infections of implantable intracardiac devices such as pacemakers are relatively rare but serious complications. In this paper we report removal of a huge vegetation in RV lead of permanent pacemaker through open surgical approach using extracorporeal circulation which was giving rise to lead endocarditis. A new epicardial lead was placed as the patient was pacemaker dependent. Though the culture of the extracted material didn't reveal any organism but the patient was improved a lot after operation from both symptomatic (subsidence of fever) & hemodynamic point of view. In follow-up OPD visit she was found to be recovered well without any complication. In conclusion, explantation of the entire pacemaker system is necessary to cure lead endocarditis in addition to appropriate antibiotic therapy.

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Introduction:

The use of implantable intra-cardiac devices such as pacemakers (PM) has improved the life span of patients. That's why pacemaker implantation has rapidly become a routine procedure since the first implantation of a completely implantable pacemaker by Elmqvist and Senning in 1958. One of the important complications of pacemakers is infective endocarditis from the leads as the source. Infection of the pacemaker pouch and wire may occur in 1-7% of implanted pacing

systems, whereas lead endocarditis, which is a more serious condition, accounts for <10% of these complications,¹ with an incidence rate ranging from 0.06%⁵ to 0.6%.² Mortality rates in cardiac device endocarditis have been reported to be 30-35%.³ Clinical findings of leads endocarditis are subtler than that of native valve infective endocarditis and thus the diagnosis is frequently delayed. Occurrence of lead vegetations (LVs) is described,⁴⁻⁶ often as anecdotal cases⁷⁻⁸ and mainly with reference to

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feasibility, safety, and clinical outcomes of lead extraction (LE).^{4,6,9}The reported prevalence of LV may change widely, due to the imaging technique involved and the phase of the illness. Treatment of cardiac device endocarditis is still controversial. Though medical treatment has been reported to be successful in some cases^{10,11}, there is increasing evidence that the entire pacing system should be removed to achieve complete infection eradication¹². In this report we describe surgical extraction of a huge vegetation in RV lead of PPM which developed 12 years after its implantation. We will focus mainly on the surgical management of lead endocarditis.

Case History:

A 50 year - old female, who was implanted a pacemaker(PM) for sick sinus syndrome, changed the PM generator after long 12 years as it was not working properly. She developed local wound infection at the generator implantation site 1 year after the change. It was treated by wound debridement and secondary closure. Wound was healed properly but two months later she developed high grade intermittent fever. Initially she was treated by different medicine specialists with antibiotic courses but fever used to recur soon after finishing the antibiotics. She was investigated thoroughly including transthoracic echocardiography (TTE) but no specific cause found. At last a multidisciplinary medical board was held in chest disease hospital and decided to repeat TTE in another facility. Second echocardiography revealed a large vegetation around RV lead of PM. Meanwhile she developed septic shock with drug induced hepatitis and admitted into our hospital under cardiology.

On admission she was found tachycardic(120 b/ min, regular), hypotensive (BP: 80/50 mmHg), requiring inotropic support, febrile (Temp-102⁰F). Laboratory values showed neutrophilic leukocytosis (TLC- 14.8 X 10⁹ / L), increased C-reactive protein (CRP- 7.85 mg/dl), mildly raised bilirubin (2.2 mg/dl). Other routine laboratory values were normal. Septic workup done. But no growth found in the blood. Urine C/s showed candida albicans (> 10⁵ CFU/ml). Broad spectrum antibiotic with antifungal started after

consultation with Microbiologist. After hemodynamic stabilization transesophageal echocardiography (TEE) done and found huge vegetation mass (4x4x3) cm attached to RV lead (Fig-1) around tricuspid valve and Right Atrium extending to SVC. RA lead tip also had vegetation. Despite broad spectrum antibiotic & antifungal coverage her total WBC count & CRP continued to rise. Multi- disciplinary medical board was arranged and decided to go for Surgical intervention.

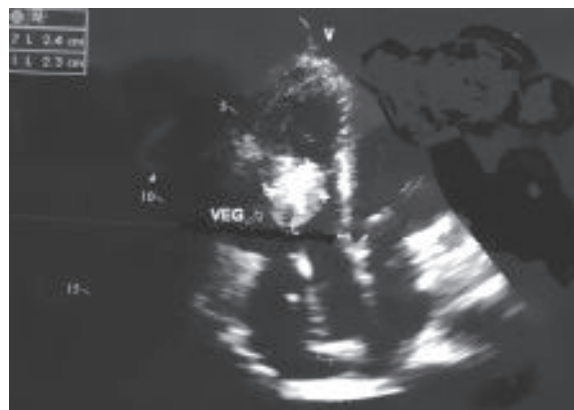


Fig.-1: Showing huge vegetation in RV Lead near tricuspid valve.

Patient was operated by cardiac surgery team. Through median sternotomy approach right atrium (RA) was opened after establishing extracorporeal circulation. Large vegetations were found involving tips of both RA & RV leads(Fig-2). The lead tips (Fig-3a)along with the vegetations were extracted(Fig-3b).Patency of

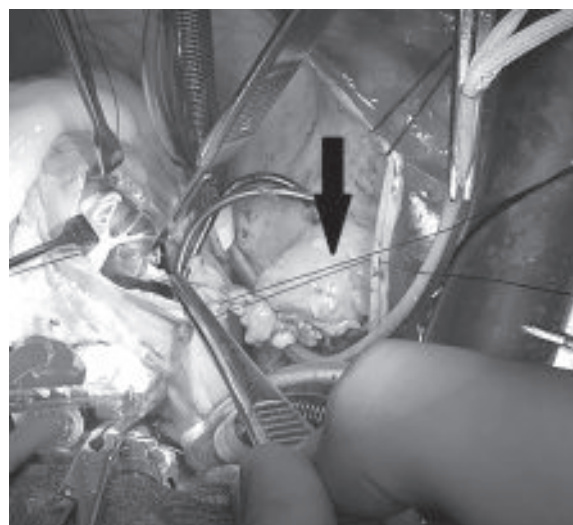


Fig.-2: Vegetation (Black Arrow) around RV lead.

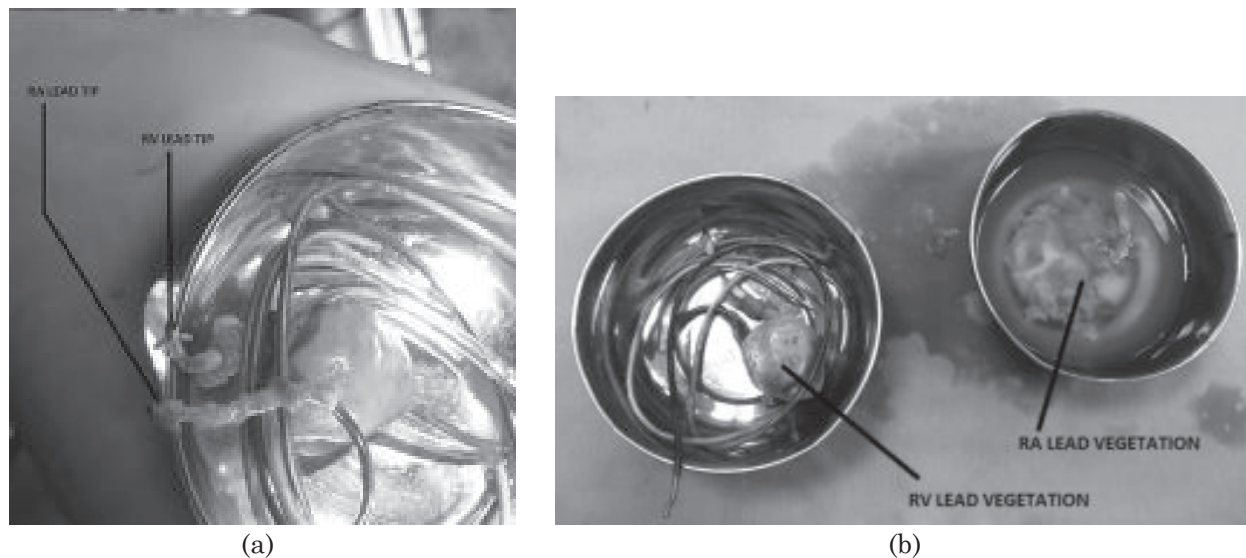


Fig.-3: (a) Figure showing tips of extracted RA & RV leads. (b) Extracted Vegetations along with Pacemaker lead.

Tricuspid valve was checked. Upper part of the RV lead was adherent to the SVC. The lead was removed through releasing the adhesion by exploring the SVC after total circulatory arrest (TCA), done at 18°C. Then closure of RA done after rewarming and the patient was slowly weaned from cardiopulmonary bypass (CPB). An epicardial pacing lead was placed over the Left Ventricle (Fig-4) which was then passed through a tunnel made on the left side of the chest &

was kept in situ in a subcutaneous pocket in left infra-clavicular region.

Her postoperative course was smooth & uneventful. A New PM generator was placed on the left side (new pocket) on 4th postoperative day (POD) and connected with the epicardial lead. It was set in VVI mode & working perfectly. Postoperative echo done on 8th POD which revealed no significant abnormality (Fig-5). Vegetations were sent for Histopathology and cultures (Bacterial and fungal). Histopathology didn't revealed any granuloma or malignancy. No bacterial or fungal growth was found in the culture. After operation her total WBC count, CRP and LFT was reduced back to normal level. We consulted with Microbiologist regarding



Fig.-4: Figure showing placement of epicardial lead on Left ventricle (LV).



Fig.-5: Postoperative echo showing no vegetation.

antibiotics, who advised to continue i.v. antibiotics and antifungal for 6 weeks. She was discharged from hospital on 10th POD and on follow up at OPD she recovered well with overall improvement of general condition and no recurrence of fever. Surgical wound healed without any complication and follow up TTE was negative for vegetation.

Discussion:

Pacemaker (PM) related infections are usually limited to PM pocket. But it may involve the leads only or whole PM system. The incidence of pacemaker infection is currently reported to range from 0.5% to 1.5%,^{7,8}. Recent studies report a prevalence of Lead vegetation (LV) in ~ 10%¹⁶ to 23%²⁹ of patients with CDI. However, these figures may fluctuate widely according to the presence/absence of systemic involvement, and may be higher in patients with CDRIE/systemic infection when compared with populations that also contain patients with pocket infections.

Clinical presentation of cardiac device-related infection (CDI) may be local, systemic, or both. Local manifestations are more common⁹ and include signs and symptoms of inflammation at the device placement site,¹⁰ possibly accompanied by fever. A chronic open skin lesion, with negative local bacteriological analyses (so-called 'chronic draining sinus'), may often be the only sign in the absence of evident infection. The intravascular segment of the lead is frequently involved in these infections.¹¹⁻¹² Infection of the pacing leads results in more severe clinical symptoms, because vegetation attached to the leads may cause infective endocarditis and promote thrombus formation in the superior vena cava and right atrium and ventricle, leading to the development of septicemia and the acute or recurrent formation of a pulmonary embolism.

The diagnosis of pacemaker infections is established by the nature of the clinical symptoms and the results of blood testing as well as ultrasonographic and radiologic imaging. However Apart from general symptoms such as fever and malaise, peripheric clinical findings of infective endocarditis are not observed frequently in these patients; hence the diagnosis is especially hard, frequently delayed and sometimes even missed. The average time from

symptom onset to diagnosis is 3–4 months. Risk factors for cardiac pacemaker related infective endocarditis are diabetes, malignancy, cachexia, use of steroids and immunosuppressive treatment¹³. Our patient was non-diabetic but there had been 8 months from symptom onset to diagnosis. Blood culture positivity in these patients are less common than patients with native valve endocarditis. But in one study carried by Victor et al.¹⁶ reported that blood cultures were positive 85% of patients with vegetation. In our case, no growth was found in the culture of blood or extracted vegetations. Echocardiography is a sensitive method for detecting

intracardiac vegetations adherent to the pacing leads. However, reviews suggest that TTE is inadequate. Victor et al.¹⁶ evaluated 23 patients with lead endocarditis and found that TTE was capable of diagnosis in only 30% of patients, whereas TEE was able to diagnose 91% of the patient population. Additionally, TEE may give detailed information about the tricuspid valve. A recent study showed that concomitant valve infection is associated with increased mortality¹⁰. Therefore, in patients with permanent pacemaker, evaluation of fever should always include a TEE examination.

Extraction of whole pacemaker system including generator leads & vegetation should be the corner stone of treatment in patients with lead endocarditis. Choo et al.⁵ suggested that without extracting the infected material, the infection cannot be controlled even if correct antibiotics are used according to antibiogram result. Our case was also an example for this conclusion. There are two different techniques for lead extraction. The first one is direct percutaneous extraction and the other option is surgical thoracotomy. Percutaneous technique can be used if the vegetation is smaller than 10 millimeters and the tricuspid valve is not involved, the time from implantation is shorter than 1–2 years and the patient is not pacemaker dependent. In other situations, surgical extraction and placement of a epicardial lead must be considered^{3,9}. In our case the open surgical approach through median sternotomy & extra corporeal circulation was used as the vegetation was large and attached SVC. Moreover, this procedure has several advantages over the intravascular extraction methods, besides being associated with a similar low

overall risk. Specifically, the risk of mechanical injury to cardiac structures and dissemination of vegetations is less because the leads are not exposed to mechanical stress and blood circulation through the right heart is interrupted during the procedure. However, the extraction of infected leads through a purse-string suture with the heart beating, as described by Niederh•auser and associates¹⁰, still carries the risk of incompletely removing vegetations, with subsequent dissemination. An open heart operation also allows additional surgical procedures to be performed in the right heart, such as reconstruction of the tricuspid valve or the removal of intra-cardiac vegetations and thrombi, which was necessary in all patients.

The preoperatively started antimicrobial therapy should be continued for at least 4-6 weeks after implantation of the new pacemaker. The new pacemaker was implanted through a different implantation site, usually the contra lateral pectoralis region or the upper abdominal area^{11,12}. In our case both strategy was followed and patient remained free of infection on subsequent OPD visit.

Conclusion:

In patients with pacemakers and risk factors for endocarditis, fever must suggest lead endocarditis and TEE must be performed for accurate diagnosis. In addition to appropriate antibiotic therapy, extraction of infected material is needed for the cure. The removal of infected leads during extracorporeal circulation prevents mechanical injury as well as the spread of infection and allows additional intra-cardiac procedures to be performed, if necessary. Complications were rare, except in patients who present lately in a critically ill condition and septic shock.

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