



Plastic Surgery

SALVAGING EXPOSED CARDIAC PACEMAKERS USING SUB-PECTORAL POCKET AND NEGATIVE PRESSURE WOUND THERAPY

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ABSTRACT

Introduction: Permanent cardiac pacemakers implanted over chest wall are prone to exposure and infection. The management of exposed pacemaker implants are controversial, and most of the time exposed devices are removed and a second device is implanted in an additional operation after days to weeks.

Methods: Between Apr 2014 and Mar 2018, 24 patients were managed for exposed cardiac pacemakers. Most patients were operated within 14 days from exposure. All patients received perioperative appropriate antibiotics. In the absence of clinical signs of infection, NPWT was started for patients where there was more than one gauze piece soaked in 24 hours. Once soakage was less than 10 ml/day, implant was covered with local skin flap or placed in a sub-pectoral pocket and NPWT applied over the suture line. Mean follow-up post salvage procedure was 20 months.

Results: Twenty two devices were saved. Only one grossly infected pacemaker was removed. In another patient implant got infected and exposed after four months of re-implantation and has to be removed and replaced.

Conclusions: This protocol allows salvage of exposed permanent cardiac pacemaker implants even several days after exposure. A combination of NPWT and sub-pectoral muscle placement lead to salvage of the implant, saving cost and morbidity to the patient.

KEYWORDS : Cardiac Pacemaker, Negative Pressure Wound Therapy, Sub Pectoral Placement

Introduction

Exposure of cardiac pacemaker devices is a relatively common event, mainly caused by inadequate tissue coverage due to a tight subcutaneous pocket. Once device is exposed it is vulnerable to contamination and subsequent bacterial infection. World over various protocols are being followed for salvage of such cardiac pacemaker including immediate removal and replacement at other site.^{1,2} Secondary replacement results in increased morbidity and cost to the patients.

There are various protocols for salvage of exposed metallic orthopaedics implants, tissue expanders and breast implants. This leads to the hypothesis that exposed cardiac pacemakers can be salvaged as well by combination of aggressive cleaning, negative pressure wound therapy (NPWT), and coverage with a local skin flap or placement in sub pectoral pocket.¹⁻⁴

We present our protocol for salvage of exposed subcutaneous cardiac pacemakers and propose it as a tool to speed healing time and avoid treatment delays.

Materials and Methods

The study was designed as a prospective descriptive analytical study. All patients with exposed cardiac pacemakers were included in study at a tertiary care centre from Apr 2014 to Mar 2018. A total of 24 patients were included in the study (Table 1- Master sheet). The centre has an intervention cardiac lab with an annual average of 220 cases of cardiac pacemaker placement.

Informed consent was obtained from each patient. A detailed clinical history was recorded. The demographic and epidemiologic data were recorded for each patient. The patients received a course of perioperative antibiotics depending on culture reports, where clinical infection were evident. Other patients received antibiotic prophylaxis at the time of surgery as per hospital antibiotic policy at vogue.

The wound swabs for cultures were taken before the start of salvage procedure. The wounds were then cleaned with normal saline and irrigated with 10 % povidone iodine solution twice a day till signs of gross infection settled. Wounds with more than one gauze piece of soakage in 24 hours were managed with NPWT thereafter (Figure 1). The NPWT used was a single use portable battery operated, canister-free system (PICO Smith & Nephew, Figure 2). Next dressing changes were done after five days and repeat swab cultures were taken. If there were no clinical signs of local infection and cultures were negative, patients were taken up for salvage procedure under local anaesthesia. The implant site was surgically debrided followed by coverage of implants with local skin flap or placed in a sub pectoral pocket along with application of NPWT. The skin sutures were removed on 10th post-operative day.

The mean follow up period was of 20 months (range 05-36 months).

Results

This was a prospective descriptive analytical study carried out in a tertiary care hospital of North India. A total of 920 cardiac pacemakers were implanted during the study period of Apr 2014 to Mar 2018. Out of these 24 cardiac pacemakers got exposed between 03 to 12 months of implantation.

The age range varied from 13 years to 66 years, with an average age of 51.29 yrs. There were 08 female and 16 male patients.

The commonest co-morbidity in this study was hypertension in 15 patients (62.5%), followed by diabetes mellitus which was present in 10 patients (41.67%).

The commonest cause of the exposure of the implants were pressure necrosis due to tight subcutaneous pockets, followed by spontaneous extrusion and trauma.

The duration of wounds post exposure, when surgical consultation were sought ranged from 02 days to 15 days, with an average of 8.91 days.

The day 1 culture isolated methicillin –sensitive *Staphylococcus aureus* in 07 wounds (29 %), *Klebsiella pneumonia* in 5 (21%), *Pseudomonas aeruginosa* in 3 (13%), *Acinetobacter baumannii* in 2 (8 %), Methicillin-Resistant *Staphylococcus aureus* in 2 (8 %) and no growth in rest of 5 wounds (21 %) (Figure 3). All patients received perioperative appropriate antibiotics based on culture sensitivity reports. Repeat cultures were done on day of change of NPWT or after completion of antibiotic therapy.

Twenty two devices were saved. Only one grossly infected pacemaker (culture MRSA) was removed. In another patient implant got infected and exposed after four months of re-implantation and has to be removed and replaced.

Discussion

There are no guideline available for management of exposed cardiac pacemakers. Literature on salvage of exposed cardiac pacemakers is limited and when a clinical infection is evident, removal and delayed replacement is advocated.⁵ Our protocol used negative pressure wound therapy (NPWT) in salvage of cardiac pacemaker along with usage of appropriate antibiotics and flap cover or sub-pectoral pocket. There are some authors who have managed subcutaneous pacemaker pocket with NPWT after removal of implant and delayed replacement of implant.⁶

Removal and delayed replacement, which is generally accepted as a

safer approach, is not devoid of complications. During ex-plantation of the pacemaker, removal of leads from the endocardium can lead to acute cardiac problems and may requires the use of temporary or external pacing device.⁵

It is generally agreed that coverage should be as early as possible, “within 48 hours of identification of exposure when possible.”² In the present series, however, due to delayed reporting, attempt were made to salvage pacemakers even after 10-14 days of exposure, with good outcome. Since control of infection is key to salvage, thorough irrigation of pacemaker and its pocket and usage of NPWT to promote healthy granulation and decrease local tissue oedema, along with appropriate systemic antibiotics was mandatory. There is contrasting evidence in the literature with regard to the need for antibiotic therapy.^{2,7}

To overcome re-exposure and possible re-infection various authors recommend pocket change and sub-pectoral placement, but there is no general agreement and different techniques have been suggested.^{1,4,7} Both sub-pectoral or sub-fascial placement of pacemaker has been suggested, with the latter becoming a preferred choice because exposure in the absense of infection is often due to pressure necrosis. Also, sub-pectoral placement of the pacemaker allows for a more pleasant aesthetic outcome and has been proposed as first choice even for primary pacemaker placement.⁸

The addition of NPWT over the suture-line, post flap surgery helps in lesser seroma formation, decreased tissue oedema and better wound healing. None of our cases had breakdown of suture line or immediate exposure of implant in post-operative period.

Conclusions

This protocol allows salvage of exposed permanent cardiac pacemaker implants even several days after exposure. A combination of NPWT and sub-pectoral muscle placement lead to salvage of the implant, saving cost and morbidity to the patient.

Conflicts of interest

Author has none to declare

Table 1 : Master Sheet : Patient Data						
S. No	Age (in years)	Sex	Duration of exposure (in days)	Soakage (Gauze pieces/day)	Culture	Pre-Operative NPWT
1	52	M	2	2	Klebsiella pneum	Y
2	34	M	6	1	Staph aureus	N
3	60	M	5	3	Pseudomonas a	Y
4	13	F	4	2	NIL	Y
5	22	M	10	4	NIL	Y
6	55	F	12	1	Staph aureus	N
7	57	M	5	1	Staph aureus	N
8	61	M	7	1	Klebsiella pneum	N
9	62	F	8	5	Acinetobacter	Y
10	55	F	10	3	Acinetobacter	Y
11	58	M	9	1	Staph aureus	N
12	45	M	7	1	Staph aureus	N
13	48	F	7	1	Staph aureus	N
14	47	M	8	3	Klebsiella pneum	Y
15	60	F	9	4	NIL	Y
16	62	M	12	1	Pseudomonas a	N
17	61	F	14	6	MRSA	Y
18	65	F	14	1	NIL	N
19	64	M	7	6	MRSA	Y
20	52	M	15	6	Pseudomonas a	Y
21	51	M	11	4	Klebsiella pneum	Y
22	50	M	13	1	NIL	N
23	48	M	11	2	Staph aureus	Y
24	49	M	9	5	Klebsiella pneum	Y

Figure 1

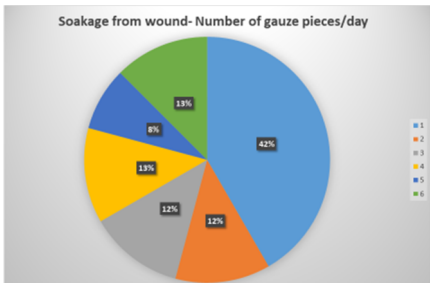


Figure 2

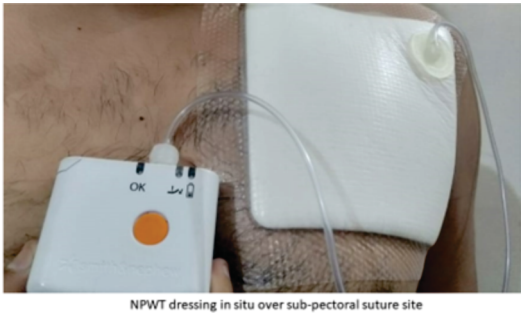


Figure 3



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