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Pectoral Sandwich Flap to Salvage Implanted Pacemaker Device - A Case Series

Vijay Bhatia[1], Anoop Gupta[2], Sruja Narola[3], Ranjit Zapadiya[3], Rahul Kaushik[3] and Archana Thakur[3]*

[1]Department of Burns and Plastic Surgery, Sterling Hospital, India

[2]Department of Cardiology, Sterling Hospital, India

[3]Department of Burns and Plastic Surgery, SVP Hospital, NHL Municipal Medical College, India

Abstract

Introduction: Cardiac pacemakers, defibrillators and Cardiac resynchronization therapies are very common in current era. These devices are susceptible to erosion, exposure, or infection and plastic surgeons are consulted when salvage is required. As of yet, subpectoral position (by lateral repositioning approach or an anterior muscle splitting approach) and intrapectoral position to effectively and safely relocate the device have been described.

Methods: Twelve patients required surgical intervention for cardiac devices over period of Four years (from August 2013 to August 2017) for exposure, erosion, potential infection, and fat necrosis within 3 to 15 months of primary impanation, none of the patients were treated for impeding erosion or cosmetic reasons.

Results: All patients were treated with pectoral muscle turn over technique to salvage the device. All the patients were culture (three cultures) negative for bacterial growth from device surface or pocket discharge. Eleven of 12 patients (91.6%) achieved successful long-term coverage in the same pocket with turnover muscle flap without recurrent exposure or hematoma and with good cosmetic results. One patient required pacemaker explantation and re-implant from the opposite side due to underlying infection.

Conclusion: The turn over muscle flap technique proposed by the authors for defibrillator or pacemaker salvage is a feasible technique with promising results.

Keywords: The turn over pectoral muscle flap; Salvage surgery; Implantable devices

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Correspondence:
Vijay Bhatia, Department of Burns and Plastic Surgery, Sterling Hospital, Ahmedabad, Gujarat, 380059, India, Tel: 0091-9825073828; E-mail: bhatia101@gmail.com

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Introduction

The development of sophisticated medical technologies has led to increase in life expectancy. In developed as well as in developing countries. This has led to increase in number of patients treated with implantable cardiac devices such as pacemakers, automatic internal cardiac defibrillators and cardiac resynchronization therapy for the management of patients prone to debilitating dysrhythmias.

Every year more than a million patients all over the world require implantable cardiac devices [1]. While these devices have undergone vast improvements in terms of design and size, none the less being foreign bodies, they are susceptible to complications including exposure, pain, palpability, and infection. Traditionally, almost all device implanters prefer a subcutaneous site of implantation in the chest that obviates dissection of deeper tissues. While this approach is well tolerated by most patients it is not appropriate for many patients, especially thin built patients.

The reported incidence of infection in state of the art centers ranges from 2 to nearly 20% of cases, while in developing countries many devices are implanted by interventional cardiologist, therefore the incidence of device related mechanical complications are likely to be higher [2-8]. These types of complications require either complete or partial removal or re-implantation of the device from opposite side and often removal of its associated leads. In a situation of device site local complications removal of the device is not always feasible as removal of device can cause devastating complications such as venous, valvular, or Atrioventricular (AV) injury, tamponade, and sudden cardiac death [9,10]. Plastic surgeons maybe consulted for salvaging or reimplanting the device as morbidity and mortality associated with device explantation may outweigh that of attempted

salvage surgery [11].

Methods

The case series is a retrospective study of 12 patients who presented with exposure, potential infection, erosion, fat necrosis. Eleven out of 12 patients were presented within 3 to 6 months after primary implantation while one patient presented 12 months after the primary implantation. All patients were treated with intrapectoral coverage *via* a turn over pectoral muscle flap technique. The patients were followed over a 48-month period between August 2013 and August 2017 (mean follow-up of 30 months).

Surgical Techniques

Patients underwent salvage surgeries under general anesthesia with all a septic precautions, in the cardiac operation theatre with portable C-arm fluoroscopy backup. Incision was kept over the previous scar over the implant, which was extended medially up to the lateral sternal border. Meticulous debridement of the pocket was performed, taking care not to damage any leads, the infected capsule surrounding the pacemaker was opened and swab culture from over the pacemaker was sent for sensitivity. Skin flaps were elevated medially up to the lateral border of the sternum and laterally distal to the implant up to the lateral border of the pectoral is major. Superiorly the dissection continued up to the clavicle and inferiorly dissection was done such that adequate pectoralis major flap could be elevated to cover the exposed pacemaker giving it a robust cover.

On elevation of the skin flap pectoral is major muscle was exposed, which was separated from its sterno-costal origin from anterior surface of the sternum and 2nd to 6th costal cartilage. Pectoral is major muscle flap was elevated based on the pectoral branch of the thoracoacromial artery, securing it under vision and elevating the pedicle with the flap. Pectoral is major muscle flap was turned over and was sutured, such that when the pacemaker is sandwiched between the muscle, the inferior border of the flap reached to the clavicle so as to provide healthy cover from below the previously dissected infected capsule. A closed suction drainage catheter was kept in the subcutaneous plane over donor site of the muscle and brought out through a remote incision. Meticulous layered closure of the subcutaneous tissue was performed to obliterate dead space. Wound was closed in layers. Incision was dressed using povidone iodine ointment covered by dynaplast elastic adhesive bandage (Figure 1, 2).

Figure 1: Pre-operative picture showing the discharging sinus over the right side of chest with visible implant at the base of the sinus.

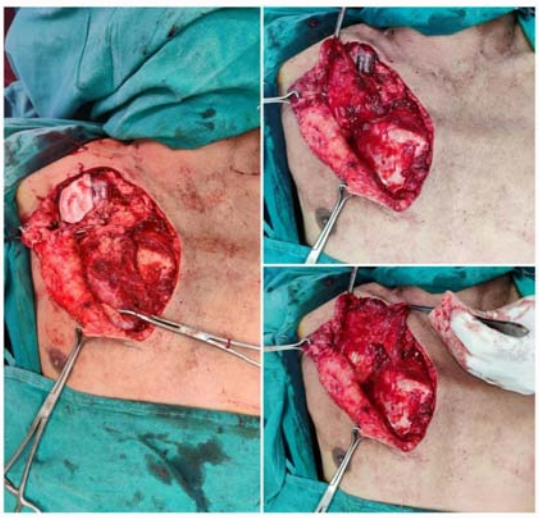

Figure 2: Pectoralis major muscle flap is raised and turned over its dominant pedicle and providing a robust cover to the implant.

Results

Between August 2013 and August 2017, a total of 12 patients were treated. There were 7 female and 5 male patients with a mean age of 57.5 years (range: 45 to 70 years old). In all cases, turn over pectoral muscle flap technique was performed without intraoperative complications. The mean follow-up was 30 months (range: 9 to 42 months). Indications for sub pectoral repositioning of the cardiac device included exposure (Five), erosion (one), infection (one), hematomata the time of initial placement by primary service (three), and fat necrosis (two). All patients except one achieved successful long-term results in the same pocket with turnover muscle flap without recurrent exposure or hematoma and with good cosmetic results. One patient required explantation after three month due to infection and wound dehiscence.

Discussion

Sub pectoral or intrapectoral positioning of cardiac devices by various techniques is well known concept, outcome of primary subpectoral placement *vs.* subcutaneous placements is not significantly different for mechanical device related complications [12,13]. So even in modern era routine approach his to place these devices into the subcutaneous space for procedural simplicity.

Device explantation is not feasible many a times as most of the devices are placed implanted from left infraclavicular position and it remains location approach for future revision as well. Additionally, healing of implantation site post device explanatation takes weeks, so keeping patients off therapy carries risks of mortality and morbidity together with cost of new device. Forth is reason, salvage by repositioning of these infected or exposed cardiac devices often becomes imperative in managing patients with debilitating rhythm disorder. Limited data has been published on techniques used for device salvage in the setting of infection or device erosion. Several authors have independently reported successful outcomes with treatment of infected device pockets by revision and placement of a continuous irrigation system or closed irrigation with or without antibiotics [14-17]. However, as device is not placed insterile plane so long term success is limited and questionable. Alternatively, with debridement, capsulectomy, and local rhomboid skin flap closures or remote pocket creation with or without antibiotic [18-21]. With these strategies, however, the risk of infection, erosion, or exposure

Figure 3: Pacemaker covered with the Turnover Muscle flap and final suture line with drain *in situ*.

may not be significantly reduced as the cardiac device is still placed within the prepectoral space and significant donor site and local site complications and tissue necrosis if extensive tissue manipulation is part of mobilization of device. As mentioned previously, sub pectoral positioning by lateral axillary approach, axillary tunneling technique for repositioning of an implantable generator from an abdominal pocket to a subpectoral location, "intrapectoral," located in a medial position between the 2 heads of pectoral is major muscle, has been described [12,22-26]. Our series demonstrates comparable overall success with intra pectoral positioning of implantable cardiac devices. Analysis of our 12 cases, with indications related exposure, erosion, potential infection, and fat necrosis, revealed a 91.6% success rate with pectoral turnover flap repositioning with 30-month mean follow-up. Important advantages of the turnover pectoral muscle flap technique include:

1- The device is given a robust muscle cover which will deliver the antibiotic and help eradicate the infection.

2- The salvage procedure is done extending the previous incision over the implant.

3- The procedure helps salvage a costly implant and its irreplaceable function in a cardiac patient especially in our institute where patients cannot afford a second implant.

4- Under the incision site now rests the healthy muscle with robust vascularity such that even on break down of the suture line the implant remains safely covered by the pectoral is the results demonstrated no hematoma or pneumothorax, abnormal sensation at local site with this approach. All surgeries were performed safely under general anesthesia in the cardiac operation theatre without need of cardiac catheterization laboratory. Like previous reports of secondary repositioning of cardiac devices into the peripectoral position, our series is retrospective and our sample size is small. But outcome of the procedure described has favourable outcome without the need for explantation or new implant placement procedure (Figure 3).

Conclusion

In the treatment of any infected implant, if explanation of an exposed implant is not possible or desired, there is a wide spectrum of treatment options and reconstructive choices, with common principle of aggressive debridement, obliteration of all dead space, and coverage with healthy vascularized tissue such as muscle flaps. Method for salvage should be individualized as per clinical situations. Our series demonstrates that salvage of cardiac devices with turnover muscle flap technique is a technically feasible approach with favorable out comes and low morbidity.

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