Basal cell carcinoma overlying a pacemaker pocket in a pacemaker-dependent patient: Management and course

Edward M. Burke, Carrie L. Brown, APN, Jack Kamenske, APN, Martin C. Burke, DO

From the Rory Childers Electrocardiology Lab, CorVita Science Foundation, Chicago, Illinois.

Introduction

The integument is the largest organ in the human body and is a robust barrier to infection, allowing for chronic implant of foreign materials that are noncarcinogenic. Skin layers act as a shield for the organs and provide protection against ultraviolet rays, burns, sores, infections, and tumors.[1,2] Basal cell carcinomas (BCC) are locally belligerent, rarely metastasizing epidermal tumors.[1,2] BCC is one of the most common tumors of the integument in the developed world.[1] It appears mostly on the face and hair-bearing areas and is more frequently inhabiting areas more protected from sunlight. In contrast, squamous cell carcinoma (SCC) appears upon areas of considerable sun exposure.[3]

The complexity of cardiac implantable electronic device (CIED) management from under a malignant tumor is high owing to complete system removal with lead extraction vs pocket revision.[1,3] CIED removal is performed when the benefits outweigh the risks, based on the type of tumor. There are no clinical data relating risk-to-benefit ratio. In modern times where life expectancy is longer, cancers of the skin are increasing in incidence, potentially making these clinical decisions more common. We report here a case of BCC directly over a pacemaker pocket in the left subclavian position that involved assessment of the management risks and benefits in an elderly patient.

KEY TEACHING POINTS

- As the population ages, basal cell carcinoma (BCC) incidence is increasing and intersecting with cardiac implantable electronic devices (CIED). Clinical decision-making is critical to maintaining the most benefit with the least amount of risk.
- The type of skin cancer has a major impact on the repositioning of CIED hardware to effect an oncologic cure.
- BCC can be completely excised when adjacent to the pacemaker pocket and hardware, and excision will likely *not* require complete extraction of the leads and pulse generator to the contralateral side of the chest.

Case report

An 88-year-old White male patient, in 2019, is referred for complete heart block, receiving a cardiac resynchronization therapy pacemaker. The patient has comorbidities of systemic and pulmonary hypertension, diastolic dysfunction, and hyperlipidemia. His ejection fraction is 67% and he takes aspirin, metoprolol, nifedipine, and atorvastatin. The patient, in 2022, is found to have a biopsy-proven BCC tumor on his upper torso over the pacemaker pocket (Figure 1) that is recommended to undergo excision. The patient is referred in return, owing to the proximity of the tumor to the pacemaker, in order to better manage the device pocket, potential need for extraction, and simultaneous tumor removal. The patient's age, frailty, comorbidities (chronic obstructive pulmonary disease [COPD]), and the type of tumor were factors in discussing and managing the best approach to maintain a sterile pocket and an excision of the tumor with margin. It was decided that the best approach in this case was to move the generator pocket to a submuscular position and then excise the tumor, thereby avoiding a CIED extraction. This approach is verbally agreed upon by the patient, electrophysiologist, dermatologist, and pathologist. The electrophysiologist takes the role of primary surgeon for the procedure.

This patient is device dependent, with 99% right ventricle and left ventricle pacing as well as 76% atrial pacing. The left chest is prepped and draped in the usual sterile fashion; the incisional approaches are shown in Figure 2. The patient has received cefazolin and vancomycin perioperatively. Upon same-day discharge, he receives doxycycline for 2 days' postoperative prophylaxis. The upper left incision for the new submuscular pacemaker pocket is performed first, away from the tumor toward the clavicle. The original device

KEYWORDS Basal cell carcinoma; Pocket revision; Pacemaker; Submuscular; Heart block; Bradycardia; Skin cancer
(Heart Rhythm Case Reports 2024;10:276–279)

Address reprint requests and correspondence: Mr Edward M. Burke, CorVita Science Foundation, 1006 S Michigan Avenue, Suite 500, Chicago, IL 60605. E-mail address: eddie@corvitahealth.org.

https://doi.org/10.1016/j.hrcr.2024.01.013

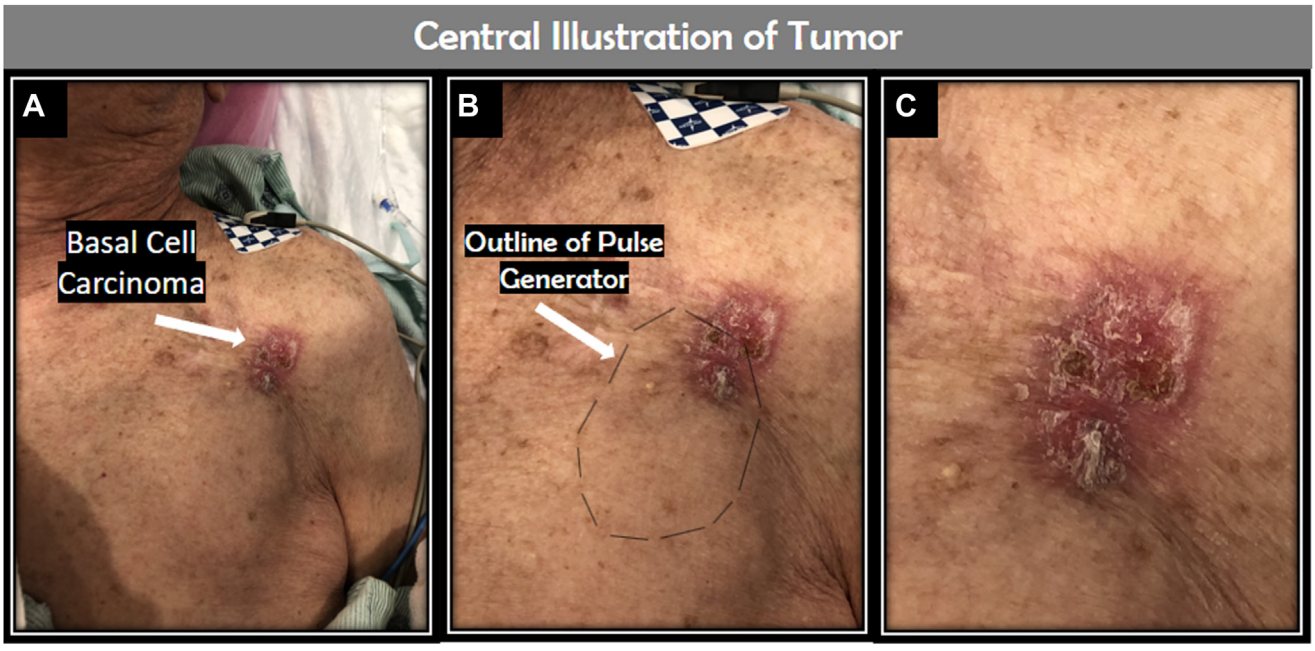

Figure 1 Central illustration of basal cell carcinoma (BCC) prior to excision. **A:** A distant view of the BCC in the left subclavian position over a cardiac resynchronization therapy pacemaker. **B:** A closer view of the skin tumor; also shown is an outline of the pacemaker's pulse generator, which shows the lateral aspect of the pulse generator underneath the carcinoma. **C:** An up-close view depicting a clear view of the BCC.

pocket is entered superiorly and the leads as well as the device are carefully dissected and freed. A new device pocket is then formed under the pectoralis major muscle and the device and leads are carefully placed into this pocket. The device is sutured to the muscle for retention. The superior clean incision is closed primarily in 3 layers of absorbable suture. Next, the BCC tumor is addressed with a 5 mm excisional margin, shown in Figure 2. The excised tissue is sent

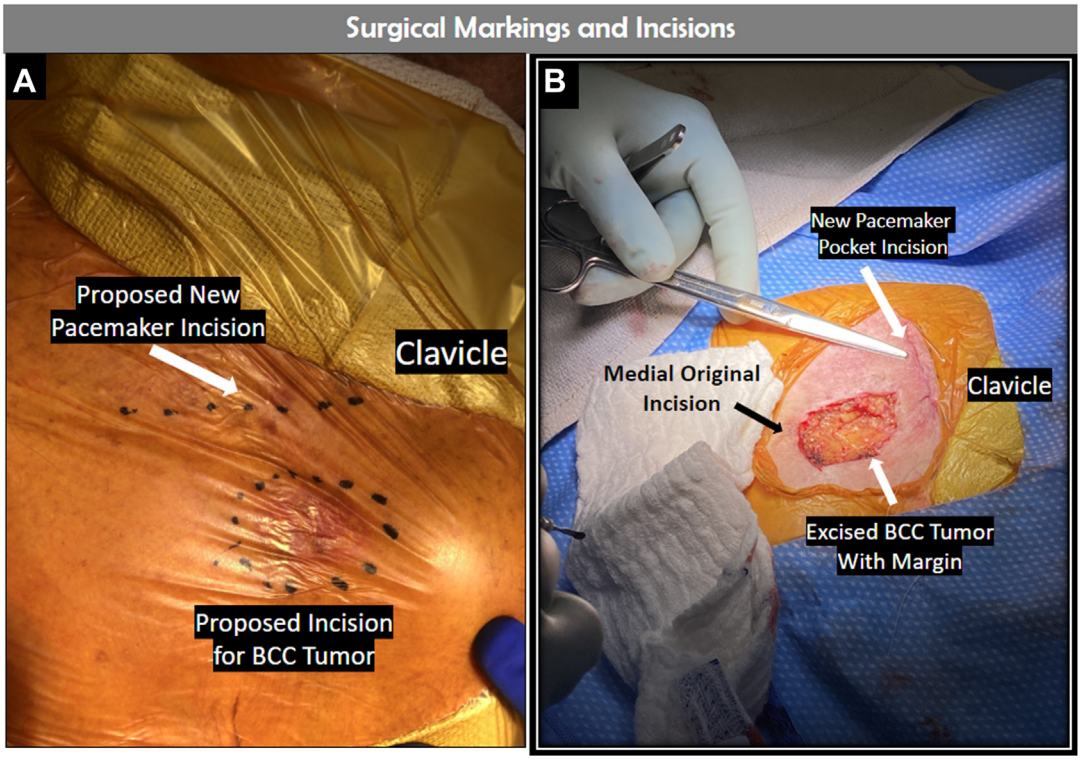

Figure 2 Surgical markings and incisions. **A:** Depiction of the surgical markings that the physician used to make the new pacemaker pocket as well as excise the skin tumor with a 0.5 mm margin. **B:** Incisions made by the surgeon mid procedure to move the pacemaker to its new submuscular pocket, with the incision closed in this figure. The wider, open incision in this figure is after the skin tumor was completely excised. BCC = basal cell carcinoma.

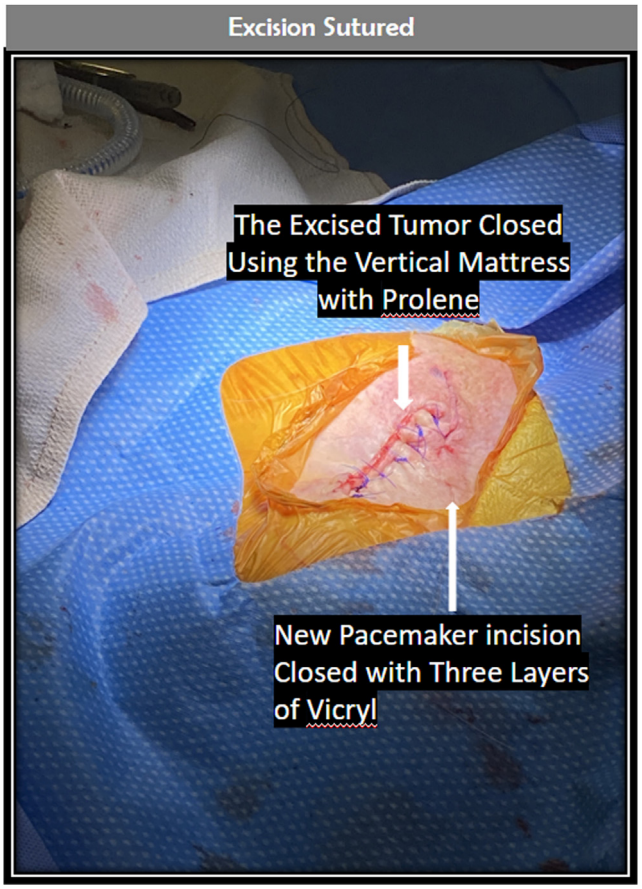

Figure 3 Primary closures. This image demonstrates both incisions primarily closed. The new pacemaker incision is shown superiorly closed in 3 layers of polyglactin 910. The excised tumor incision is closed with a vertical mattress using polypropylene.

to pathology for gross inspection of border and with an affirmation of complete excision; then the tumor site is closed with a vertical mattress of polypropylene suture technique (Figure 3).

Pathology reports on an unoriented oval of skin measuring 5 × 3 × 1 cm. The central portion of the skin is remarkable for an irregular depressed lesion measuring 3 × 2 cm. It is grossly 0.3 cm to the closest lateral margin. Grossly, the lesion appears to be completely excised.

The patient's incisions are monitored and the polypropylene sutures are removed at 10 days postoperatively. The wounds and device function have proceeded normally and after 6 months the device pocket position and skin have continued to be free of infection. The patient is now in normal follow-up, without recurrence of BCC in the left chest and with normal pacemaker function.

Discussion

The main finding of this report of an indolent-growing BCC tumor associated with a pacemaker pocket has shown that management of the pacemaker and the tumor simultaneously on the ipsilateral chest is safe and effective. Clinical decision-making is critical in this case owing to the proximity of the tumor to a pacemaker in the subcutaneous space.[4–6] The tumor invades the surface of the skin over the pacemaker, which, if left untreated, could lead to erosion of the pacemaker and infection. The pacemaker's slightly protruding subcutaneously in this frail elderly man put the pocket at risk of infection if left intact during the BCC excision. Moving the pacemaker can be accomplished either ipsilaterally or contralaterally to the original pocket through tunneling as well as complete extraction and reimplant. This is the first reported case to leave the device intact ipsilaterally while curing the cancer via excision. Here, we present moving the pocket to the submuscular plane, splitting the muscle. A different approach using a lateral axillary approach may be considered in the case of more tumor burden and limited distance from the tumor excision site. In an axillary access the muscle is only lifted, without any muscular incision, to accommodate the generator in the submuscular position. The tumor removal using an elliptical surgical excision after the pacemaker is sterilely moved to a submuscular pocket using a superior-medial incision is essential. Both wounds are closed primarily to aid healing.

Although there have been no studies done on the removal of BCC with a complex pacemaker revision, there are reports that described SCC management. Bodagh and colleagues[4] present a patient with an SCC overlying a pacemaker site. They decided to take a slightly different surgical approach using a maxillofacial and cardiac surgical team to excise the tumor and then extract the pacemaker and replace it contralaterally. They highlight how multidisciplinary planning can cause a favorable clinical outcome in a rare case where a patient has a tumor overlying a pacemaker site. Although the surgical process was different from ours, we did employ a multidisciplinary approach. Our surgical management of the device is more conservative owing to the minimally invasive nature of BCC compared to SCC.

Preceding the study by Bodagh and colleagues is another case,[5] which presented a patient with an atypical fibroxanthoma developing in a pacemaker pocket. Unlike our case and the SCC case, fibroxanthoma refers to a benign dermal proliferation of fibroblasts and histiocytes. However, once the tumor was excised the surgical team determined that the fibroxanthoma was mimicking a pyogenic granuloma. Much like fibroxanthoma, a pyogenic granuloma is often associated with a history of trauma and begins as a small erythematous papule that enlarges rapidly and ulcerates if not excised. This is unlike a BCC or an SCC, which most likely will arise from exposure to high ultraviolet radiation.[1–3] Tumors such as clear cell hidradenocarcinoma, breast carcinoma, plasma cell neoplasia, nasal carcinoma, rhabdomyosarcoma, lung sarcoma, and non-Hodgkin lymphoma all have presented in pacemaker pockets.[6] These tumors differentiate because they do not overlay pacemaker pockets epidermally; instead, they are subcutaneous, often invading inside the pocket itself or needing radiation therapy in proximity. The case group led by Gonzalez-Vela and colleagues[5] reports that no previous evidence of an atypical

fibroxanthoma arising in the pacemaker pocket has been reported. After some review they found 4 reports of malignant soft tissue tumors reported at pacemaker sites. This has helped them conclude that physicians should routinely check on patients, especially those who are device dependent, for a possible malignant tumor in their respective pacemaker pocket.

Risk/benefit

Many possible risks go into complex pacemaker revisions and lead extractions.[7] Physicians are always trying to minimize the probability of those potentially harmful risks when performing various procedures. One of the risks we were trying to minimize was a possible infection related to the pacemaker. There are many possible solutions to reduce the risk of infection, but to create those solutions we first must address the factors that cause the infections in the first place. A study done by Barbar and colleagues[8] presents the relationship between increased risk of infection and male sex. Although there are higher risks of infection in men, it is shown that women have a higher mortality rate when obtaining a pacemaker site infection. This study also presents 3 comorbidities—renal failure, diabetes mellitus, and COPD—that increase the risk of infection. As presented above, 1 of our patient's comorbidities today is COPD, therefore increasing his risk of infection. This case report demonstrates a safe and effective method to treat patients with BCC near a pacemaker pocket.

Funding Sources: None.

Disclosures: No conflicts of interest to disclose.

References

1. Cotran RS. Metastasizing basal cell carcinomas. Cancer 1961;14:1036–1040.
2. Murphy GF, Krusinski PA, Myzak LA, Ershler WB. Local immune response in basal cell carcinoma: characterization by transmission electron microscopy and monoclonal anti-T6 antibody. J Am Acad Dermatol 1983;8:477–485.
3. Epstein E, Epstein NN, Bragg K, Linden G. Metastases from squamous cell carcinoma of the skin. Arch Dermatol 1968;97:245–251.
4. Bodagh N, Pappa E, Farooqi F. Multidisciplinary surgical team approach for excision of squamous cell carcinoma overlying pacemaker site. BMJ Case Rep 2018; 2018:bcr2017221660.
5. Gonzalez-Vela MC, Salcedo W, Neira C, Gonzalez-Lopez MA, Ayala H, Val-Bernal JF. Atypical fibroxanthoma developing on a pacemaker pocket mimicking a pyogenic granuloma. Cardiovasc Pathol 2013;22:102–104.
6. Reyes CV. Clear cell hidradenocarcinoma developing in pacemaker pocket. Pacing Clin Electrophysiol 2008;31:1513–1515.
7. Kusumoto FM, Schoenfeld MH, Wilkoff BL, et al. 2017 HRS Expert Consensus Statement on Cardiovascular Implantable Electronic Device Lead Management and Extraction. Heart Rhythm 2017;14:506–548.
8. Barbar T, Patel R, Thomas G, Cheung JW. Strategies to prevent cardiac implantable electronic device infection. J Innov Card Rhythm Manag 2020;11: 3949–3956.