CASE REPORT

Multidisciplinary surgical team approach for excision of squamous cell carcinoma overlying pacemaker site

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SUMMARY

We report an unusual case of an elderly man presenting with a fast-growing large malignant tumour involving the skin overlying his permanent pacemaker site. The fast-growing cutaneous squamous cell carcinoma appeared 2 years after pacemaker implantation. Joint specialist input was required to tackle this complex problem as a wide surgical excision would expose the pacemaker generator risking device infection particularly if the skin graft reconstruction failed. Having established that the patient had minimal pacing needs, it was determined through expedited multidisciplinary discussion that the best option was excision of the lesion with skin grafting of the defect by maxillofacial surgical team and pacemaker generator removal by a cardiologist in a joint surgical procedure. The procedure was successful and uneventful. This case highlights how effective multidisciplinary planning can help achieve a favourable clinical outcome in a patient with a rare case of a squamous cell carcinoma overlying a pacemaker site.

BACKGROUND

Cutaneous squamous cell carcinomas are malignant tumours that arise from the upper layers of the epidermis.¹ They most commonly grow on sun-exposed areas.² Often they can be associated with a poor prognosis. This report describes the development of a rapidly growing cutaneous squamous cell carcinoma overlying the scar from a dual chamber pacemaker site. Joint specialist input from maxillofacial surgeons and cardiology was necessary to plan curative excision with a 1 cm rim of healthy skin in close proximity to the pacemaker generator and connecting leads. The development of a squamous cell carcinoma overlying a pacemaker has never before been reported in published literature and the challenges faced to manage it required both urgent and meticulous multidisciplinary planning to achieve the best possible clinical outcome for the patient.

CASE PRESENTATION

A 94-year-old man presented with trifascicular heart block (right bundle branch block, left anterior hemifascicular block and first-degree heart block) and syncope. He was treated with a dual chamber pacemaker for presumed transient high-grade atrioventricular block or excessive bradycardia as he already had evidence of age-related conductive system fibrosis. Over 2 years later, he developed a rapidly growing exophytic, ulcerated

lesion clinically representing a cutaneous squamous cell carcinoma overlying the superior end of skin incision site in the left infraclavicular area.

This patient had been noted to have had a small flat erythematous and scaly lesion over his left infraclavicular area some 18 years before his pacemaker was implanted, which was thought to be non-malignant. He had previously received multiple skin excisions for basal cell carcinomas involving his right leg, left cheek and right temple, and an actinic keratosis from his right leg. He was on apixaban for paroxysmal atrial fibrillation which had been identified through regular pacing checks following pacemaker insertion. Approximately 2 years after the pacemaker had been implanted, he presented to accident and emergency department with bleeding from a growth under the left collar bone. In the acute setting, the bleeding appeared fairly profuse and this was likely to be attributable to the patient's apixaban anticoagulant therapy. Nonetheless, it ceased and the patient was subsequently discharged home. He then re-presented to his general practitioner (GP) 2 days later with the lesion that had grown very rapidly. Due to the highly suspicious change in the nature of the original skin lesion, the GP referred the patient under the urgent 2-week wait pathway to dermatology.

INVESTIGATIONS

A dermatology consultant reviewed the patient and subsequently referred to maxillofacial surgery with a view to eventual surgical excision. An incision biopsy of the exophytic skin lesion (figure 1) was performed. Tissue histology confirmed moderately differentiated squamous cell carcinoma. A workup CT scan of the head, neck and thorax demonstrated the presence of a fungating polypoidal cutaneous lesion in the left supraclavicular region with no evidence of neck or chest node metastasis or clavicular bone invasion. The combination of the biopsy and workup CT scan enabled staging of the tumour, indicating that the malignancy could potentially be cured by wide local skin excision. This was the agreed plan of action when the multidisciplinary team, consisting of dermatologists, pathologists, oncologists, radiologists and surgeons, discussed the patient's case.

DIFFERENTIAL DIAGNOSIS

- ▶ Squamous cell carcinoma.
- ▶ Keratoacanthoma.
- ▶ Basal cell carcinoma.

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Figure 1 Large exophytic ulcerating skin lesion on the left clavicular area prior to surgical excision.

- Malignant melanoma.
- Actinic keratosis.
- Bowen's disease.

TREATMENT

Based on the investigation results, a decision was made to surgically excise the squamous cell carcinoma. Due to the size of the defect following the excision, reconstruction with a split thickness skin graft from the leg was also necessary. As removal of the skin tumour would expose the pacemaker site, the case required liaison with the cardiology team to plan how to mitigate operative risk and potential haemodynamic complications. A wide surgical excision with a safety margin would result in exposure of the pacemaker generator, risking device failure, infection and lead endocarditis, particularly if the overlying skin graft patch failed to heal in this very thin patient with little or no subcutaneous fat.

The patient was not pacemaker dependent. To assess the burden of pacing therapy required by the patient, the cardiology team reprogrammed the pacemaker mode from DDDR to VVI at 30 bpm 1 week prior to the planned operation. This confirmed the underlying trifascicular heart block with only short sinus pauses, none of which were symptomatic or required back-up pacing support. The patient remained asymptomatic with no dizzy spells or syncope demonstrating no necessity for back-up pacing during the week of the programming change. We surmised from this that it might be safe to remove the generator and terminate pacing activity intraoperatively and postoperatively without haemodynamic instability. Based on an evaluation of the risks and benefits, the decision was made to remove the

pacemaker generator intraoperatively and cap and bury both lead tips in an accessible pocket more remote from the skin graft to enable potential future generator reimplantation at a later date, if necessary. The alternative of implanting the existing connected generator into a deeper subpectoral pocket was considered, but there was justifiable concern that this approach would temporarily expose the generator to contaminated discharge from the tumour resulting in a serious device infection which could only be cured by full pacemaker and lead extraction (a high-risk procedure associated with significant mortality risk³).

Following expedited multidisciplinary planning between the cardiology team and maxillofacial surgical team, it was agreed that the joint surgical procedure should be performed under local anaesthetic with two sets of scrub teams in a cardiac catheterisation laboratory environment in case the patient developed excessive bradycardia/haemodynamic instability after disconnection from the generator necessitating emergency pacing. Apixaban anticoagulation was stopped 2 days prior to the procedure. On the day of the operation, haemostasis was achieved through the utilisation of 16 mL of lignocaine with epinephrine and bipolar diathermy. The squamous cell carcinoma was excised (figure 2) by the maxillofacial surgeon with macroscopically clear margins. The pacemaker generator was explanted through the same skin opening by the cardiologist and the two leads were gently mobilised by dividing adhesions, and the terminal pin connectors were capped and buried in an inferior prepectoral pocket more remote from the skin defect. The maxillofacial surgeon harvested an 18×8 cm split thickness skin graft from the patient's left thigh and used it to patch and reconstruct the defect with the utilisation of sponges and skin clips (figure 3).

OUTCOME AND FOLLOW-UP

The patient was admitted overnight for postoperative observation on a general surgical ward and reviewed by the maxillofacial surgeon the next morning. The patient did not complain of any pain postoperatively and clinical examination revealed minimal bruising around the pacemaker site with no evidence of infection or excessive bleeding. He was subsequently discharged with antibiotic prophylaxis and follow-up in the oral maxillofacial surgical dressing clinic 17 days later. The patient recommenced his apixaban 1 week postoperatively. Upon review by the maxillofacial team, 2 weeks after surgery, all the dressings and stitches were removed, and it was noted that the skin graft had

Figure 2 Site of the excision of the squamous cell carcinoma showing the defect intraoperatively prior to application of the split thickness skin graft.

completely healed with no rejection and that wounds both on donor and recipient site were healing very well with no signs of infection (figure 4). The patient was advised to report any potential symptoms relating to excessive bradycardia (syncope, lightheadedness or dizzy spells), but thus far has remained free of symptoms.

The final histopathology report (from the wide local excision of the tumour) confirmed a moderately differentiated squamous cell carcinoma with no perineural invasion. There were however two foci of lymphovascular invasion. The maximum tumour thickness was 26 mm. The tumour was completely excised with at least 7 mm at the peripheral margin and 2.6 mm at the deep margin. Another layer from the deep margin that was additionally excised was free of tumour. In light of these findings, the case was discussed by the multidisciplinary team and it was decided that no further adjuvant treatment was required.

DISCUSSION

Pacemakers are an effective means of treatment for a number of symptomatic bradyarrhythmias with approximately 70%–80% of them implanted in patients aged 65 and over.⁴ The incidence of squamous cell carcinoma is known to increase with age⁵ and can occur within a scar formation. As such, it is conceivable that the incidence of squamous cell carcinomas in patients with pacemakers could also increase in the future.

Squamous cell carcinomas are typically investigated by visual inspection (clinical examination) and subsequent biopsy for histology.⁶ Biopsies can either be excisional (where the whole lesion is excised) or incisional (where a part of the lesion is excised). The decision on the type of biopsy to perform is guided by the size of the lesion and the cosmetic effect of the biopsy itself. A biopsy yields a histopathological diagnosis. Subsequent investigations can be performed to assess disease extent. CT imaging can be used to look for bone or soft tissue spread while MRI is useful for assessing the extent of perineural invasion where relevant. The main aim of treatment for cutaneous squamous cell carcinoma is complete removal of the tumour and any possible metastases.¹ The gold standard treatment for cutaneous squamous cell carcinoma is surgery but other options exist.⁶ These include curettage and cautery, cryotherapy, topical treatment, photodynamic therapy, electrochemotherapy, Mohs micrographic surgery and radiotherapy.

In the case we describe, an incision biopsy of the large exophytic skin lesion was performed to establish the clinical diagnosis. The CT scan demonstrated that there was no bone

invasion of the underlying clavicle or any distant metastasis and that the tumour was only invading the soft tissues locally. These investigations and the patient's clinical history were discussed among the multidisciplinary team. The multidisciplinary team consisted of dermatologists, pathologists, oncologists, radiologists and surgeons. It was determined that surgical removal of the tumour under local anaesthetic would be the most appropriate option in this scenario. This decision was based on the clinical requirement to perform the fastest and safest possible procedure in this 94-year-old patient.

The metastatic potential and prognosis of a cutaneous squamous cell carcinoma is influenced by a number of factors.¹ These include tumour site, size, thickness, level of invasion (perineural or lymphovascular invasion), degree of histological differentiation, nodal involvement and host immunosuppression. It is interesting to note that a number of factors associated with the tumour in this case are associated with a good prognosis. The tumour arose from a non-sun-exposed site. Histopathology revealed a moderately differentiated squamous cell carcinoma with no perineural invasion. CT imaging did not reveal any nodal involvement or metastases. There was also no evidence of immunosuppression in our patient. These factors could well have contributed to the favourable clinical outcome that ensued.

The case we describe involves a patient who had a pre-existing skin lesion in the left infraclavicular region prior to pacemaker implantation. While early histological confirmation is lacking, it is most likely that this patient had a slow-growing squamous cell carcinoma in situ. This type of tumour, also known as Bowen's disease, is defined as a squamous cell carcinoma in situ of the skin restricted solely to the epidermal skin layer with no invasion of the basement membrane.⁷ Usually, Bowen's disease requires treatment with either surgery or topical chemotherapy though there is no definitive treatment regimen.⁸ Prior to the patient's acute presentation described in this case, careful observation of

Figure 3 Split thickness skin graft (harvested from the patient's left thigh) applied over the defect and secured in situ with stitches, sponges and skin clips with no signs of excessive bleeding.

Figure 4 The operation site with the split thickness skin graft 2 weeks after the operation following removal of the dressings and stitches showing a satisfactory healing process with no signs of infection.

the lesion appeared a reasonable option. Unfortunately, the lesion unexpectedly suddenly transformed into a much more aggressive rapidly growing tumour necessitating surgical intervention. This occurred 2 years after pacemaker implantation. No cutaneous complications were reported prior to the patient's presentation to the emergency department with a bleeding skin lesion. Some of the cutaneous complications that can ensue from pacemaker insertion include bruising, haematoma formation and, in some cases, pacemaker erosion through the skin.⁹ While no post-operative complications were reported, such a procedure will inevitably result in some degree of skin trauma and/or scarring. Aggressive ulcerating squamous cell carcinomas can develop in areas of previously traumatised¹⁰ or scarred skin.¹¹ Such carcinomas are known as Marjolin's ulcers. This case describes the development of a highly aggressive, ulcerating tumour overlying a previous site of skin trauma. These are all features of Marjolin's ulcers¹² providing a possible explanation for the clinical presentation of the patient described in this article.

Through reprogramming of the pacemaker mode 1 week prior to surgery, we were able to determine that the patient was not pacemaker dependent. This allowed for complete removal of the pacemaker generator. The lead tips were then buried in a pocket away from the skin graft to enable potential future generator reimplantation should the clinical situation change at a later date. Pacemaker generators can be implanted in the right infraclavicular fossa, axilla or under the pectoralis major muscle where necessary.¹³ In our case, if the patient were to become symptomatic with bradycardia, a pacemaker generator could be implanted deep to pectoralis major muscle on the existing left side or alternatively positioned on the contralateral right infraclavicular side with the existing left-sided leads tunnelled across the subcutaneous plane to meet the generator.

The development of basal cell carcinomas^{14–16} and malignant melanomas¹⁷ overlying pacemaker implantation sites has previously been described. To our knowledge, we report the first case of a cutaneous squamous cell carcinoma developing over a pacemaker scar. Through meticulous preoperative planning and careful consideration of the potential for adverse effects to occur, we were able to successfully excise the patient's tumour

without incident or complications with a multidisciplinary team approach.

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Contributors NB wrote the manuscript and conducted the literature review. EP was the treating maxillofacial surgeon and obtained the images. FF was the treating cardiologist and critically reviewed the manuscript. All the authors contributed to the intellectual context and approved the final version.

Competing interests None declared.

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Learning points

- The incidence of skin cancer overlying a pacemaker is extremely rare but is likely to increase as the population ages.
- There are a number of management options available for cutaneous squamous cell carcinoma. The type of treatment used will depend on the results of the investigations performed and the degree of tumour spread.
- Complex or unusual clinical problems in patients may benefit from a multidisciplinary team approach, careful advanced planning and shared decision-making to help determine the best course of action.

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