International Journal of Research in Orthopaedics
Nair A et al. Int J Res Orthop. 2023 May;9(3):589-592
http://www.ijoro.org

DOI: https://dx.doi.org/10.18203/issn.2455-4510.IntJResOrthop20231188

Case Report

Complete transection of permanent pacemaker lead by a dislocated left shoulder prosthesis

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Received: 03 January 2023
Revised: 04 April 2023
Accepted: 10 April 2023

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ABSTRACT

A case of complete transection of the leads of a permanent pacemaker (PPM) by a dislocated left shoulder prosthesis is reported. An 86 year old woman with a history of B-cell lymphoma diagnosed subsequent to a pathological fracture of the humerus in 2010 was managed by a left shoulder replacement. Subsequently, she underwent chemotherapy for the B-cell lymphoma and the malignant lesion was reported to have resolved. In addition, she further went on to have a PPM- left sided DDDR inserted in 2015 for chronotropic incompetence. Following a mechanical fall she had in 2021, it was found that the PPM leads had been damaged, transected, potentially infected and failing to capture along with a displaced left shoulder prosthesis which was the likely culprit for the PPM damage. A decision was made to not remove the dislocated prosthesis by the multidisciplinary team managing her. This case highlights the importance of an understanding of the complications of shoulder surgeries, including approach adopted for surgery in patients with pacemaker in-situ and the need for regular follow up and imaging.

Keywords: Shoulder dislocation, Permanent pacemaker, Total shoulder replacement

INTRODUCTION

Shoulder replacement surgeries are an increasingly common treatment for end stage shoulder degenerative conditions. With regard to the survival rates of replacements, the estimated 10-year survival for total shoulder replacement is 94·6% (95% CI 93.6-97.6) and humeral hemiarthroplasties is 90.4% (87.0-94.0).[1] The mean age at primary surgery is 72.2 years (SD=8.9), with a majority of them performed in women (72%).[2] There has been a significant increase in the number of electronic implantable cardiac devices in the recent past, with more older patients and more medical co-morbidities that have potential implications on management.[3]

A study showed significant dearth of knowledge among shoulder surgeons and orthopaedic trainees regarding delto-pectoral approach used for pacemaker insertion by cardiologists.[4] Shoulder joint dysfunction with a highly significant reduction in range of motion is a frequent complication of cardiac device implantation.[5]

The awareness of pacemaker implants (PPM), its surgical approaches for insertion and potentially fatal complications in a patient undergoing a shoulder replacement/arthoscopic surgery is invaluable for shoulder surgeons. It also highlights the need for involvement of a multi-disciplinary team and raise awareness for management of these cases due to increasing incidence of both pacemaker implantation as well as shoulder replacement surgeries in the general population. Also, the risks to a PPM from shoulder replacement surgeries has not been fully recognized.

CASE REPORT

An 86 year old woman was admitted after a history of a fall while wheeling a bin outside, she sustained injury to

her left hand and left side of her forehead, she was pyrexial on admission. She also complained of a twitch on her left shoulder for a couple of months which was not painful.

Her past medical history was significant for hypothyroidism, chronic kidney disease, severe left ventricular systolic dysfunction. She also had a history of atrial flutter, aortic stenosis, chronic heart failure and a permanent pacemaker implant for chronotropic incompetence.

She underwent a shoulder replacement surgery in 2010 following a pathological fracture of the humerus and humeral head which was subsequently diagnosed as B cell lymphoma for which she underwent chemotherapy with R-CHOP regimen following which the lymphoma was reported to have resolved.

Her medication history revealed that she was on apixaban for deep atrial flutter.

She was independent, had limited mobility and did not smoke tobacco or drink alcohol.

Initial examination and imaging revealed a slightly displaced fracture of the 4th and 5th metacarpals along with an area of swelling near the left shoulder which was neither hot or tender, soft and surrounded by an area of crepitus around a hard object which was likely to be the shoulder prosthesis.

A constant twitch of the pectoral muscle was visible, which the patient reported got worse when she would lie on her back. Investigations revealed raised inflammatory parameters including CRP, chest X-ray was suggestive of a curled up right ventricular (RV) lead about 3 cm above the pacemaker generator and the right atrial (RA) lead crushed and transected around the left shoulder prosthesis with the device turned off and neither lead working.

Based on these findings a suspicion of localized infection in her left shoulder was considered possibly involving her RV lead, and subsequently the important question of management was raised whether to remove the extra-thoracic portion of the leads and fluid filled mass along with possible surgical intervention in the form of removal of the prosthesis/amputation.

The patient underwent a PET scan in view of her being pyrexial and previous history of B-cell lymphoma which showed some uptake in the RV lead and prosthesis. She further received intravenous antibiotics and blood cultures came back negative. A multidisciplinary team involving shoulder surgeons, cardiologists, infectious disease specialists, Hematologists and respiratory physicians after careful review, discussion and assessment with the patient herself agreed upon conservative management with lifelong antibiotic prophylaxis as any surgical intervention risked further life threatening complications. She was subsequently followed up in clinic post her discharge and reported good baseline health and no complications pertaining to her conservative management.

Investigations

Figure 1 shows right ventricular lead is not functioning as it has retracted and lies coiled up next to the permanent pacemaker. The right atrial lead is in satisfactory position. Left shoulder prosthesis noted appears dislocated likely long standing?

Figure 1: XR left shoulder.

PET-CT (Figure 2) shows an Increased FDG uptake in the subcutaneous/intramuscular portion of the leads is probably due to inflammation secondary to left shoulder prosthesis dislocation and fracture of the lead, however difficult to exclude infection in this region. No abnormal FDG uptake along the rest of the leads.

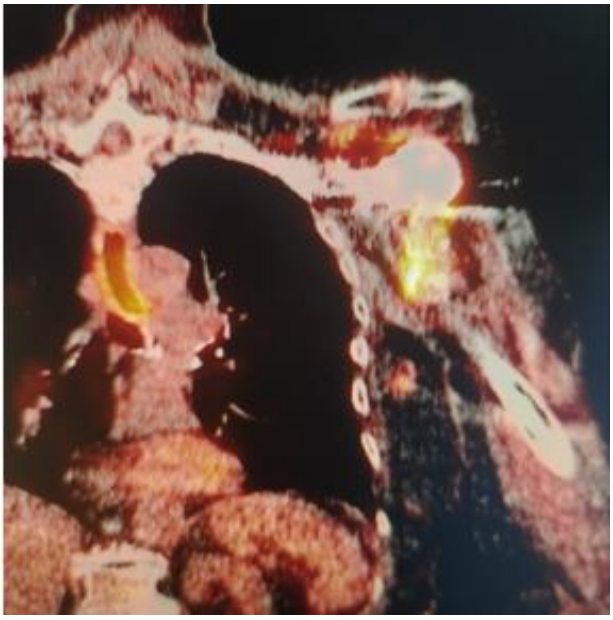

Figure 2: PET-CT scan.

Differential diagnosis

Following the presentation of the patient, initial approach was intended to look for the focus of infection and in a background of previous B-cell lymphoma to look for possible relapse/recurrence. Clinical examination was consistent with a soft, non-tender swelling with crepitus around the area of the left shoulder. With raised inflammatory markers and the patient being pyrexial, initial suspicion was towards an infected prosthesis or likely collection in the form of an abscess. Subsequent XRs confirmed the RA lead to have been transected and the RV leads were coiled in around the shoulder 3 cm above the pacemaker generator, suggesting possible infection or inflammation of the displaced leads. With the infective material possibly seeping down into the bone, chronic osteomyelitis was also a possible suspicion as the patient was otherwise fit and well before the fall. The PET-CT showed uptake around the RV leads and prosthesis with clinical findings of possible collection, the patient was managed with Intravenous Antibiotics. A multidisciplinary team was involved in the management and after careful consideration of various factors and discussion with the patient, non-operative management was decided to be the most appropriate plan to treat her infection, transected leads as well as the dislocated prosthesis.

Treatment

Non-operative management in the form of lifelong antibiotic prophylaxis with doxycycline 100 mg twice a day after consultation with infectious disease specialists for dislocated and displaced PPM leads and shoulder prosthesis.

Follow up

As part of follow-up, the patient was seen in clinic regularly for the next 6 months and the team was satisfied with her progress as she did not have any particular complications pertaining to the non-functioning pacemaker in situ or the broken shoulder prosthesis. The patient was eventually discharged from follow-up after 6 months.

Figure 3: Irregular narrow complex tachycardia likely suggestive of atrial fibrillation.

DISCUSSION

The delto-pectoral approach used by many cardiologists for pacemaker insertion is imperative for the understanding of shoulder surgeons as there is the potential to cause harm to patients if the insertion site and type of device is not identified before commencing surgery in this region and steps must be taken to minimise any intra-operative risk.[4] There is lack of published cases showing similar complications of a shoulder prosthesis leading to transection of the leads which makes this case very unique yet vital in the understanding of various approaches used by surgeons and cardiologists. A case of Intraoperative pacemaker malfunction during a shoulder arthroscopy has been reported in literature.[6] There appears a dearth of knowledge regarding the pacemaker placement and related patient safety, there is a risk from direct injury to the pacemaker and/or leads as well as the hazards of using diathermy in close proximity to a pacemaker. There must be more widespread dissemination of this information in order to minimise risks to patients with pacemakers *in situ*.[4] This rare but vital case therefore highlights the importance of awareness of such potentially life threatening complications with pacemakers and shoulder prosthesis.

CONCLUSION

The delto-pectoral approach used by many cardiologists for pacemaker insertion is imperative for the understanding of shoulder surgeons as there is the potential to cause harm to patients if the insertion site and type of device is not identified before commencing surgery in this region and steps must be taken to minimise any intra-operative risk. There is lack of published cases showing similar complications of a shoulder prosthesis leading to transection of the leads which makes this case very unique yet vital in the understanding of various approaches used by surgeons and cardiologists. A case of intra-operative pacemaker malfunction during a shoulder arthroscopy has been reported in literature. There appears a dearth of knowledge regarding the pacemaker placement and related patient safety, there is a risk from direct injury to the pacemaker and/or leads as well as the hazards of using diathermy in close proximity to a pacemaker. This rare but vital case therefore highlights the importance of awareness of such potentially life threatening complications with pacemakers and shoulder prosthesis.

Recommendations

It is recommended that surgeons be aware of the delto-pectoral approach employed by cardiologists for pacemaker insertions including Anatomy of the cephalic vein, which is an important landmark in shoulder surgery as well as the insertion points in most cases of pacemaker insertions. Adopting a multi-disciplinary approach including a regular follow-up and regular imaging while managing a patient with shoulder replacement surgery in a background of pacemaker insertion should be a standard

practice for better surgical outcomes. Reporting rare complications in the form of case reports enhances knowledge among care providers. With increasing arthroscopic procedures in recent times, it further emphasizes the need for adequate anatomic knowledge regarding pacemaker systems and its insertion techniques. There must be more widespread dissemination of this information in order to minimise risks to patients with pacemakers *in situ*.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

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Cite this article as: Nair A, Akkena S, Salihy MA, Rohan, Pillai A. Complete transection of permanent pacemaker lead by a dislocated left shoulder prosthesis. Int J Res Orthop 2023;9:589-92.