

An unusual cause of pocket hematoma: Injury to a superior thoracic artery branch



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Introduction

Despite considerable advances in pacemaker technology, vascular access, and implantation technique, implant site hematomas remain a challenging and important procedural complication. There is a significant increase in infection risk and morbidity associated with hematomas. The majority of hematomas are managed conservatively; however, occasional cases that do not respond to conservative management do occur. Here we present a pacemaker hematoma caused by injury to a branch of the superior thoracic artery, which resolved after embolization of the vessel. While rare, arterial injury should be kept in mind in cases of hematomas that do not respond to initial conservative management.

Case report

A 65-year-old man underwent pacemaker implantation at our institution. He had sinus node dysfunction and nonischemic cardiomyopathy with ejection fraction 45% and left bundle branch block at baseline. Owing to the ongoing need for atrial pacing and anticipated high ventricular pacing burden as well as left bundle branch block, a cardiac resynchronization therapy pacemaker was implanted. He was anticoagulated with apixaban for a history of atrial fibrillation and per routine protocol Eliquis was not interrupted for the device implant. The axillary vein was cannulated, guided by contrast venography using a 21G micropuncture needle (Figure 1a). Three separate punctures were made in the axillary vein. The coronary sinus was easily accessed and a quadripolar lead advanced to a lateral vein without phrenic nerve capture and excellent thresholds. The right atrial and right ventricular leads were similarly placed uneventfully. The procedure otherwise went smoothly with no indication of any problem during the procedure. Postprocedure radiography did not show any complication and he was discharged uneventfully.

KEYWORDS Pacemaker; Pseudoaneurysm; Hematoma; CIED; Resynchronization
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KEY TEACHING POINTS

- Injury to branches of the axillary artery should be considered in cases of pocket hematoma that do not respond to conservative management.
- Early consultation with the interventional radiology service in cases of such vascular injury can be successful in managing pocket hematomas.
- Computed tomography angiography is a useful imaging modality to look for vascular injury at or near the pacemaker implant site.

He presented to the emergency room on postprocedure day 7 with worsening pain and swelling at his pacemaker site (Figure 1b). His examination was significant for a rather diffuse area of swelling, which involved the device pocket itself as well as the axilla. The patient was very tender to palpation of the area as well as to any movement of the shoulder. The edges of the device were not easily appreciated on palpation. As part of an initial work-up the emergency room physician obtained a computed tomography angiogram. This was notable for an active site of bleeding, felt to be from a branch of the superior thoracic artery (Figure 2b). There was significant edema of the pectoralis minor. The site of bleeding arose in proximity to the pacemaker leads.

The interventional radiology service was consulted and coiled a pseudoaneurysm of a superior thoracic artery branch. (Figure 3a and 3b). Right common femoral access was obtained and a 5F sheath placed using ultrasound and 21G micropuncture set. The procedure was done under moderate sedation with 2 mg intravenous Versed and 50 mcg intravenous fentanyl. The left subclavian artery was selected with a Vert catheter (Merit Medical, South Jordan, UT) and Glide Advantage wire (Terumo Interventional Systems, Tokyo, Japan). The pseudoaneurysm was identified after selecting the left axillary artery and performing the angiogram. The left superior thoracic artery was selected with an 0.016 fathom wire (Boston Scientific, Marlborough,

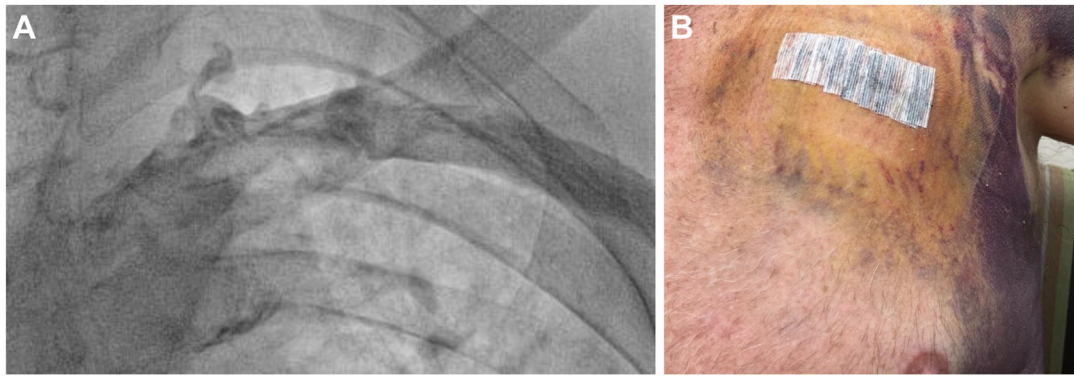


Figure 1 Device implantation and complication. **A:** Contrast venography to guide axillary venous access. **B:** De-identified photograph of the device site on postoperative day 7.

MA) and 2.6F lantern microcatheter (Penumbra, Penumbra Inc, Alameda, CA). A selective angiogram was performed in the lateral thoracic artery from the microcatheter. Following this, coil embolization was performed beginning distal to the pseudoaneurysm and ending proximal to the pseudoaneurysm. The first coil deployed was a 2 mm \times 2 cm ruby soft coil (Penumbra, Inc, Alameda, CA) followed by a 3 mm \times 15 cm penumbra ruby soft coil (Penumbra Inc). Follow-up microcatheter angiogram in the proximal lateral thoracic artery and angiogram from the Vert catheter in the left axillary artery demonstrated resolution of the pseudoaneurysm. Angio-Seal (Terumo Interventional, Tokyo, Japan) was used for groin closure.

Following the procedure the patient experienced a marked improvement in pain, with swelling and ecchymosis gradually resolving. Eliquis was held for 48 hours after the intervention, and was then restarted without further issues.

Discussion

This patient presented with an implant site hematoma. Early imaging diagnosed an unusual source of bleeding not often reported in the electrophysiology literature and the arterial

injury was promptly addressed by coil embolization. The incidence of injury to branches of the axillary artery during pacemaker implantation is not known. There are only a few cases described in the literature,^{1–3} and only 1 of these to the superior thoracic artery. Given the fact that most hematomas are initially managed conservatively without angiographic imaging, the incidence of arterial injury and its role in postimplant hematoma is not known. The location of the superior thoracic artery as it runs across the axillary vein cannot be identified with certainty using contrast venography or ultrasound. There is significant variability in the course of the branches of the axillary artery and no clear fluoroscopic landmarks as to their course.^{4,5} In this case, the axillary vein was punctured at the lateral border of the first rib, a common site of venous access, and the pseudoaneurysm is seen to form near this site. Computed tomography angiography proved useful in our and other cases to diagnose the site of bleeding and imaging was not significantly affected by the presence of the pacemaker, supporting the use of this imaging modality to evaluate postdevice bleeding complications.

In summary, pocket hematomas are known complications of pacemaker implant and their presence is a significant

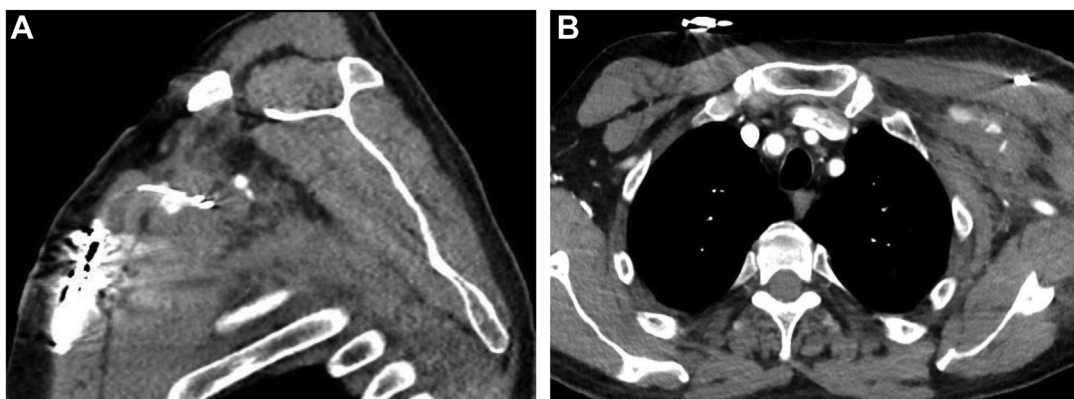


Figure 2 Computed tomography angiography to identify the location of bleeding. **A:** Sagittal section displaying active extravasation in proximity to the course of the pacemaker leads (highlighted in red circle). **B:** Axial section through area of active extravasation.



Figure 3 Identification and treatment of site of bleeding. **A:** Subselective arteriogram demonstrating active extravasation and pseudoaneurysm of a superior thoracic artery branch. **B:** Post coiling angiogram with successful occlusion.

source of morbidity after implant. The presence of hematoma increases the risk of subsequent complications such as wound infection.⁶ Conservative measures resolve the vast majority of hematomas and, importantly, prevent the violation of the pocket with attendant increase in infection. Injury to an arterial branch should be considered in the differential for hematomas after device implant, particularly if initial conservative therapy fails or the rate of expansion or degree of pain seem out of proportion to a typical presentation.

Conclusion

Injury to branches of the axillary artery can occur after device implantation. In cases of continued hematoma expansion or ongoing pain despite conservative measures, prompt diagnosis and treatment can be effective in managing this important complication.

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References

1. Bera D, Dharia T, Trivedi A, et al. Iatrogenic subclavian arteriovenous fistula during permanent pacemaker implantation: closed by endovascular coiling. *J Arrhythm* 2018;34:322–325.
2. Steckiewicz R, Kosior DA, Stolarz P, et al. Iatrogenic left lateral thoracic artery injury during pacemaker implantation successfully treated with stentgraft implantation. *Kardiol Pol* 2012;70:537–539.
3. Sharma A, Pandey NN, Kumar S. Pacemaker site pseudoaneurysm from superior thoracic artery: an uncommon offender. *Acta Cardiol* 2019;74:538–539.
4. Astik R, Dave U. Variations in branching pattern of the axillary artery: a study in 40 human cadavers. *J Vasc Bras* 2012;11:12–17.
5. Kumar N, Paul VS, Bhat KMR, Aithal AP. Bilateral variation in the branching pattern of the subclavian artery: an unusual finding with clinical implications. *J Vasc Bras* 2023;22:e20220147.
6. Tarakji KG, Korantzopoulos P, Philippon F, et al. Infectious consequences of hematoma from cardiac implantable electronic device procedures and the role of the antibiotic envelope: a WRAP-IT trial analysis. *Heart Rhythm* 2021;18:2080–2086.