

Occult Arterial Bleeding Associated With Cardiac Device Implantation

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Abstract

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Short Title: Arterial injury after pacemaker implantation

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Keywords: Pacemaker, Complication, Arterial bleeding, Coil embolization

Introduction

Blind puncture of the axillary or subclavian artery is common during the implantation of cardiac devices. Inadvertent arterial injury is rare, but can result in life threatening bleeding. Recognition of this phenomenon and approach to treatment is critically important. Herein we report 2 cases of inadvertent arterial injury during device implantation.

Case 1

A 74-year-old man presented underwent uneventful implantation of a cardiac resynchronization defibrillator (CRTD). Extra-thoracic puncture of the axillary vein in the region of the first rib was performed using fluoroscopic guidance. Approximately 3 hours post implantation the patient was noted to have significant pectoral swelling associated with pain (Figure 1A). Despite 1 hour of continuous manual pressure, there was ongoing expansion in the pectoral region with an associated decrease in hemoglobin from 13.8 to 10.4g/dl.

A computed tomography angiogram scan of the thorax was performed. A large hematoma in the region of the pectoralis major muscle and extending into the left axilla region was noted with contrast extravasation into the hematoma suggesting active arterial bleeding from the thoracoacromial branch of the left axillary artery (Figure 1B). After discussion with vascular surgery and interventional radiology, coil embolization was performed (Figure 1 C, D). The hematoma no longer expanded, and slowly resolved over the ensuing week.

Case 2

An 84-year-old woman underwent implantation of a single lead atrioventricular (VDD) pacemaker via an axillary approach. Pectoral swelling with an associated reduction in her hemoglobin from 12.2 g/dl to 5.0 g/dl was noted. After 2 units of packed red blood cells were transfused the patient was urgently taken to the operating room for exploration of her device pocket. A hematoma was not identified during this procedure but minor oozing from the initial puncture site was noted and subsequently cauterized. She continued to have declining hemoglobin, ongoing expansion of her device pocket and experienced an acute kidney injury with creatinine increased to 202 umol/L. CT angiography was performed which identified a chest wall hematoma with active bleeding from a ruptured pseudoaneurysm of the left superior thoracic artery at the site of the pacemaker lead insertion (Figure 2A). The patient underwent emergent coil embolization of the pseudoaneurysm (Figure 2B, C). Antiplatelet therapy was reinitiated and the patient remained stable for the duration of their hospitalization.

Discussion

Pocket hematoma at the time of device implantation occurs in 2.1-5.3% [1] of all device implantation and can usually be managed conservatively with manual pressure. The most frequent reason for a pocket hematoma is bleeding related to the use of anticoagulation, and typically venous or capillary bleeding [2]. Usually, this bleeding is self limited and managed with manual pressure.

The arterial injury should be considered with a rapidly expanding hematoma that persists despite manual pressure and is associated with hemodynamic compromise and an important hemoglobin drop early post pacemaker implantation. In this scenario CT angiogram can confirm the diagnosis, thereby avoiding unnecessary pocket exploration. Interventional approaches including the use of coils showed in the literature that it may be therapeutic [4].

Arterial injury after device implantation is rare and reported in less than 2% of cases have post-catheterization pseudoaneurysms in upper extremity [3]. This rate is higher than we expected. At our institution 2 such complications were known to occur between January 2012 and December 2021. During this time more than 4208 new device implants were performed suggesting an incidence of less than 0.0005% for this complication making it truly rare. In our cases, venous access was obtained with the first pass so a venogram was not performed as our usual practice is to perform a venogram if access is not readily obtained. These cases

highlight the proximity of branches of the main subclavian artery, namely the thoracoacromial artery and its side branches, to the axillary vein and the fact that there may be an unintended and unknown injury of these small vessels during routine and sometimes perceived uncomplicated venous access (Figure 3).

While direct cephalic cut down with visualization of the cephalic vein may avoid this complication, this approach is not always feasible. It remains unclear whether an ultrasound guided approach may facilitate identification and avoidance of injury to small arterial branches adjacent to the axillary vein [5] While venous access with ultrasound guidance may avoid pneumothorax or direct puncture of the main axillary artery if is not clear if this approach will avoid injury to small side branches of the axillary and subclavian artery as these smaller branches may not be visualized. It is possible that more distal access to the axillary vein in the region of the second rib may avoid this complication as there be fewer sub-branches in that area, but this is simply speculative as variation in arterial branching may occur in patients.

Conclusion

The novel teaching point is an arterial injury to tributary arterial branches of the axillary and subclavian vein should be kept in mind in hematomas that do not respond to conservative treatments after pacemaker implantations. CT is important in diagnosis and coil embolization may be necessary.

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Figure Legends

Figure 1 First Patient

1 A. Hematoma of the patient after pacemaker implantation, **1 B** Hematoma under pectoral muscle and extravasation on computerized tomography, **1 C.** Extravasation of subclavian artery branch on the catheter laboratory, **1 D.** After coil implantation to the perforated artery

Figure 2 Second Patient

2 A. Hematoma and Extravasation on computerized tomography, **2 B.** Extravasation of subclavian artery branch on the catheter laboratory, **2 C.** After coil implantation to the perforated artery

Figure 3 Relationship between subclavian artery and vein



