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CASE REPORT: CLINICAL CASE

Axillary Artery Pseudoaneurysm Following Percutaneous Transaxillary Access for Impella Device Placement During Percutaneous Coronary Intervention

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ABSTRACT

Percutaneous transaxillary access is currently considered an acceptable alternative to transfemoral approach for large-bore access, especially in the setting of hostile iliofemoral arteries. Few published reports exist concerning complications of upper extremity access. We describe development of an axillary artery pseudoaneurysm and its management following transaxillary access. (**Level of Difficulty: Advanced.**) (J Am Coll Cardiol Case Rep 2020;2:907–10)

A 61-year-old woman with a prior history of coronary artery disease requiring coronary artery bypass grafting presented to the cardiology clinic with typical retrosternal chest pain that radiated to her left arm and was associated with shortness of breath for several weeks. On physical examination, her blood pressure was 124/78 mm Hg, and her pulse was 75 beats/min, and she was saturating normally on room air at 95%. She did not have jugular venous distention or carotid bruit, and her lungs were clear to auscultation bilaterally. She had a regular heart rate and rhythm, and no murmur could be appreciated. Her basic laboratory test results were relatively unremarkable. Given her presentation and past medical history, she underwent a diagnostic coronary angiogram that revealed occlusion of her graft vessels and severe, native multivessel disease,

LEARNING OBJECTIVES

- Thorough physical examination of the access site and post-procedural imaging (i.e., ultrasonography) if necessary are especially important to mitigate complications like pseudoaneurysm and extravasation before patient discharge.
- Although rare, pseudoaneurysms of the axillary or subclavian arteries can occur as a result of large-bore vascular access for complex PCI or TAVR.
- A pseudoaneurysm of the axillary artery can be effectively managed with minimally invasive approaches, including endovascular stenting or thrombin injection in selected cases.

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The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the *JACC: Case Reports* author instructions page.

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ABBREVIATIONS AND ACRONYMS

PCI = percutaneous coronary intervention

TAVR = transcatheter aortic valve replacement

including a severe lesion in her left main coronary artery.

After a multidisciplinary heart team discussion, the patient was deemed high risk for repeat surgical intervention given her overall comorbidities. The patient subsequently underwent high-risk percutaneous coronary intervention (PCI) with mechanical circulatory support using an Impella (Abiomed, Danvers, Massachusetts) cardiac output device. A percutaneous transaxillary approach was performed because her common femoral arteries were known to be small in caliber and diffusely diseased. Upon completion of the PCI and removal of the Impella device, arteriotomy-site closure was only partially successful with a Perclose (Abbott Vascular Devices, Redwood City, California) suture-type closure device. Balloon tamponade with a 9.0 × 40-mm Mustang (Boston Scientific, Marlborough, Massachusetts) balloon was performed and repeated multiple times at 10 atm for 10 min with deflations for 2 min. Hemostasis, including no extravasation, dissection, or perforation, was confirmed with angiography.

Following the procedure, the patient developed a medium-sized hematoma at the insertion site associated with a decrease in hemoglobin that remained stable on serial blood draws. She was discharged 3 days later and evaluated in the clinic the next week. At that time, she endorsed improvement of her pain at the hematoma site, and no obvious size increase, thrill, or bruit was noted on physical examination. However, 1 week later she presented to the emergency department with worsening right upper extremity pain and a significant mass at the axillary access site.

PAST MEDICAL HISTORY

In addition to coronary artery disease and coronary artery bypass grafting, her history was remarkable for essential hypertension, hyperlipidemia, and morbid obesity.

DIFFERENTIAL DIAGNOSIS

Her presentation to the emergency room and worsening mass were concerning for an arterial pseudoaneurysm, extravasation and hematoma, seroma formation, or infection with abscess.

INVESTIGATION

Physical examination of the site revealed pulsatility of the mass, suggesting pseudoanyeurysm formation. For confirmation, computed tomography angiography of the right upper extremity showed active extravasation of contrast into a pseudoaneurysm of the right axillary artery (Figures 1 and 2).

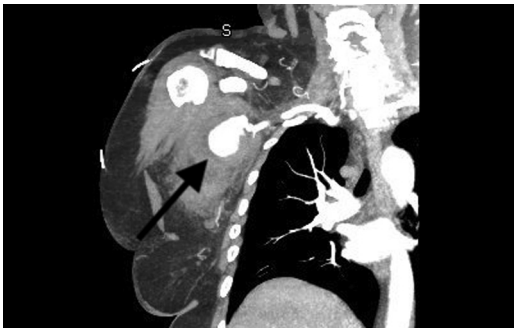
FIGURE 1 Axial View of the Right Axillary Artery Pseudoaneurysm Before Intervention

Computed tomography (axial view) with angiographic image of the pseudoaneurysm showing the right axillary pseudoaneurysm with active contrast extravasation before the intervention **(black arrow)**.

MANAGEMENT

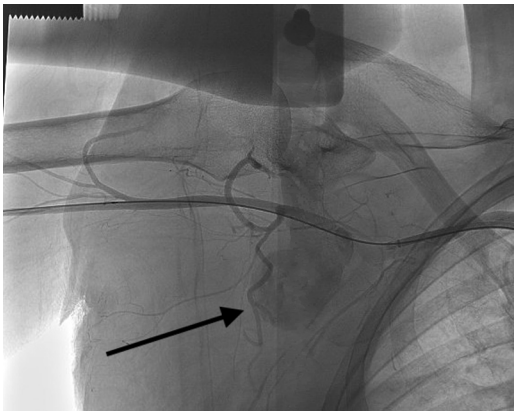
After diagnosis, she underwent stenting of the right axillary artery (Figure 3 and 4). The procedure was conducted via a transfemoral approach by using ultrasound guidance and initially a 5-F introducer sheath. A pigtail catheter was inserted, and an aortogram obtained, which demonstrated the pseudoaneurysm with active extravasation. The sheath was

FIGURE 2 Coronal View of the Right Axillary Artery Pseudoaneurysm Before Intervention



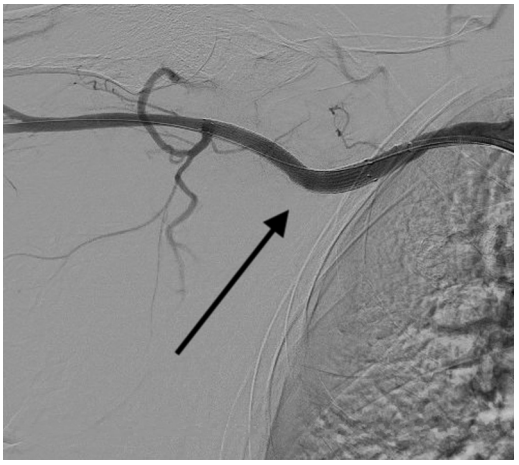
Computerized tomography (coronal view) with angiographic image showing the right axillary pseudoaneurysm with active contrast extravasation with large axillary hematoma before stenting **(black arrow)**.

FIGURE 3 Angiogram of the Right Axillary Artery Pseudoaneurysm Before Stent Placement



Angiogram of the right upper extremity showing the right axillary artery pseudoaneurysm before stenting with active extravasation **(black arrow)**.

FIGURE 4 Angiogram of the Right Axillary Artery Pseudoaneurysm After Stent Placement



Fluoroscopy with angiography showing exclusion of the pseudoaneurysm after 8- × 75-mm Viabahn polytetrafluoroethylene-covered stent placement **(black arrow)**.

traded out for a 90-cm 7-F introducer sheath positioned at the level of the clavicle. The dilator was reinserted into the sheath for support, and the apparatus was pushed distally past the area of injury. A V18 wire was then inserted to the level of the axillary artery, and the dilator was removed. An 8- × 75-mm Viabahn stent (Gore, Newark, Delaware) was chosen because of the size of injury and was inserted through the sheath and successfully deployed. An 8 × 40-mm angioplasty Mustang balloon was then insufflated along the stent to allow for complete expansion. After removal of the balloon, an angiogram demonstrated complete resolution of the pseudoaneurysm. The sheath was removed, and a ProGlide (Abbott Vascular Devices) device was deployed to achieve hemostasis at the access site.

DISCUSSION

Percutaneous transaxillary access is emerging as an alternative approach for large-bore interventional procedures, such as Impella device placement and transcatheter aortic valve replacement (TAVR) in the setting of hostile iliofemoral arteries (1). Schäfer et al. (2) analyzed 100 patients retrospectively who underwent TAVR through a transaxillary approach and showed that 95% had successfully placed devices, with mortality rates of 6% at 30 days and 14.8% at 1 year. The majority of patients (85%) underwent a left axillary artery approach rather than access from the right axillary artery. In our case, the patient underwent his procedure via the right axillary artery due to operator preference.

This paradigm shift will inevitably result in a different set of possible complications. Schäfer et al. (2) reported an 11% rate of minor access site complications and no major access site complications. All 11 of these patients required stent graft placement following sheath removal because of residual bleeding. They also noted that as operator experience increased, fewer minor complications occurred (2). To our knowledge, this is the first case reporting a pseudoaneurysm of the axillary artery following percutaneous transaxillary access. Similarly, a right subclavian artery pseudoaneurysm has been reported after PCI via a transradial artery approach (3). In general, upper extremity pseudoaneurysms are rare compared to femoral artery pseudoaneurysms. Reported cases are usually secondary to penetrating trauma, including stabbings or gunshot wounds (4) or iatrogenic secondary to misplaced central venous catheters (5).

Upper extremity pseudoaneurysms should be managed based on presentation, including location, size of the sac and neck, and hemodynamic stability of the patient. Management can vary from external manual compression to urgent open surgery (6). In most patients, the first-line therapy will be endovascular covered stent placement, as long as the origin of the pseudoaneurysm is away from any major branches. Ultrasound-guided thrombin injection into the aneurysmal sac can also be considered if the sac is accessible percutaneously and the neck is narrow (<3 mm).

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FOLLOW-UP

Follow-up with computed tomography angiography was performed 8 months after the intervention and revealed no evidence of extravasation, with complete resolution of the pseudoaneurysm and improved hematoma size. The patient was also seen in the clinic 14 months after her procedure and reported no residual symptoms.

CONCLUSIONS

Iatrogenic axillary and subclavian artery pseudoaneurysms are rare complications following cardiac procedures. Their frequency may increase as percutaneous transaxillary access for large-bore interventional procedures is adopted. More data are needed to ascertain the incidence, natural course, and prognosis of upper extremity pseudoaneurysm formation with different procedures. Managing these lesions endovascularly with covered stent placement is a minimally invasive approach with positive outcomes.

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REFERENCES

1. Hallak A, Wei L, Berzingi C, Moreland J, Alkhouli M. Percutaneous axillary access for large-bore arteriotomy: a step-by-step guide. J Card Surg 2018;33:270–3.

2. Schäfer U, Deuschl F, Schofer N, et al. Safety and efficacy of the percutaneous transaxillary access for transcatheter aortic valve implantation using various transcatheter heart valves in 100 consecutive patients. Int J Cardiol 2017;232:247–54.

3. Villanueva-Benito I, Solla-Ruiz I, Rodriguez-Calveiro R, Maciñeiras-Montero JL, Rodriguez-Paz CM, Ortiz-Saez A. Iatrogenic subclavian artery pseudoaneurysm complicating a transradial percutaneous coronary intervention. J Am Coll Cardiol Img 2012;5:360–1.

4. Chen L, Peng F, Wang T, Chen D, Yang J. Traumatic pseudoaneurysm of axillary artery combined with brachial plexus injury. PLoS One 2014;9:e113099.

5. DuBose JJ, Rajani R, Gilani R, et al. Endovascular management of axillo-subclavian arterial injury: a review of published experience. Injury 2012;43:1785–92.

6. Shah K, Halaharvi D, Franz R, Jenkins J II Treatment of iatrogenic pseudoaneurysms using ultrasound-guided thrombin injection over a 5-year period. Int J Angiol 2011;20:235–42.

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