

Venous pseudoaneurysm in a dialysis patient

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ABSTRACT

We present a case of embolization for post-angioplasty pseudoaneurysm of the internal mammary vein. A 62-year-old male presented to the emergency department with right upper extremity edema. One month prior, he underwent angioplasty of right cephalic, subclavian, and innominate veins for similar symptoms but felt they had worsened. Computed tomography with intravenous contrast revealed pseudoaneurysm of the right internal mammary vein, and the patient was taken emergently to the operating room where embolization was successfully performed. Central venous pseudoaneurysm is a rare complication of angioplasty and the unique considerations of the anatomic region necessitate discussion of the optimal treatment modality. (*J Vasc Surg Cases Innov Tech* 2024;10:101548.)

Keywords: Central venous disease; Hemodialysis; Pseudoaneurysm

Venous pseudoaneurysm (PSA) is a rare complication of catheter interventions, given normally low venous pressure. In patients with hemodialysis access, however, the central veins are subject to arterialized flow. Only three cases of central venous PSA after catheterization are documented,¹⁻³ although venous PSA elsewhere after angioplasty has been reported.⁴ Treatments including conservative management, thrombin injection, and coiling are described.¹⁻³ The central venous location precludes treatment with ultrasound-guided compression or thrombin injection, which are performed in the periphery.⁵ Compared with endovascular intervention, direct repair of the central veins in the setting of arteriovenous fistula (AVF) incurs increased risk, including vessel occlusion and hemorrhage, with potentially fatal outcomes.⁶⁻⁸ Dialysis patients have comorbidities that augment these risks. Conservative management may allow compression of nearby structures, free rupture, and/or death. We present a case of venous PSA after angioplasty and discuss management. The patient was treated with an Amplatzer plug (Abbott) with resolution of flow in the PSA and greatly improved arm swelling. Patient was stable in follow-up and consented to having his case published.

Subsequent follow-up was not possible as the patient died of unknown causes several months after treatment.

CASE REPORT

A 62-year-old male with prior end-stage renal disease and right upper extremity (RUE) AVF, no longer requiring dialysis, presented to the emergency department with RUE and chest swelling (Fig 1). One month prior, he had undergone balloon angioplasty of the right cephalic, subclavian, and innominate veins at an outside hospital for similar symptoms but felt he had worsened since intervention. At the time of presentation, these outside images were not accessible. His heart rate was 119 bpm, and his blood pressure was 205/107 mmHg. He complained of shortness of breath. D-dimer was 2941. Exam revealed asymmetric edema of the upper extremities, severe in the right hand, but good perfusion with 2+ radial pulses bilaterally. The right hand and wrist demonstrated pitting edema and decreased range of motion; he could not make a fist. Computed tomography angiogram showed stenosis of the right subclavian and innominate vein junction with what appeared to be venous PSA of the internal mammary vessel (IMV) measuring 6.5 × 4.7 × 3.6 cm and focal short segment stenosis of the subclavian/innominate vein junction, the PSA caudal to this area (Fig 2). Given concern for aneurysmal progression or rupture, emergency fistula ligation with possible embolization was recommended.

The patient underwent informed consent and was brought to the operating room. The fistula was first ligated to eliminate the arterial pressure. The hypertrophied right brachiocephalic fistula was exposed above the antecubital fossa. The brachial artery was controlled above and below the AVF. The fistula was transected. The arterial side was oversewn with 3-0 Prolene suture while maintaining a strong pulse in the distal brachial artery. The venous side was oversewn with 5-0 Prolene suture. The cephalic vein was accessed above the ligated fistula to access the central circulation. A micropuncture needle was placed into the fistula stump through which a wire was advanced and upsized to a 5 F sheath. A venogram of the RUE revealed

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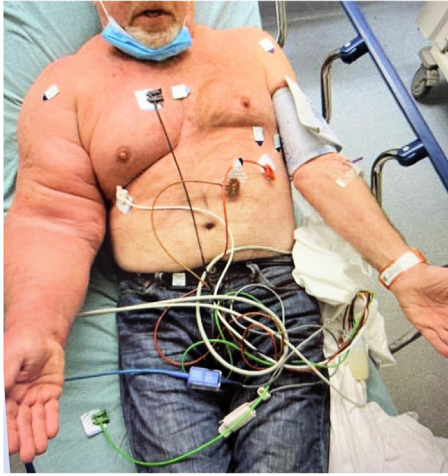


Fig 1. Patient on initial presentation in the emergency department.

a hypertrophied, tortuous cephalic vein, but no arterialized flow. The catheter was advanced. Venography of the innominate vein and superior vena cava (SVC) revealed aneurysmal IMV. An angled catheter and wire were used to select the IMV origin. A 9 F sheath was positioned over the wire into the aneurysm sac, and an Amplatzer plug was deployed in the neck and central venous portion of the aneurysm sac. The plug was chosen over coils because it could be placed into the neck of the PSA with precision and fill the sac. Venogram showed the plug in good position. Repeat venography with the catheter in the cephalic vein revealed no residual flow in the PSA. All devices were removed, and the cephalic vein was repaired directly at the antecubital fossa with 5-0 Prolene suture.

On postoperative day one, the patient's edema had improved, and pain was controlled. On day two, the patient reported significant improvement in the tension in his RUE, and he had regained range of motion at the wrist, hand, and fingers. The patient was cleared for discharge from a vascular perspective, but inpatient management of persistent hypertension was recommended. He declined and left the hospital against medical advice. At a 1-month follow-up, the patient had RUE edema but was satisfied with the reduction compared with presentation (Fig 3). Vital signs were at the patient's baseline. Sutures and staples were removed from RUE incisions. Subsequent imaging was discussed; however, the patient died before his 3-month follow-up appointment from unknown etiology.

DISCUSSION

Incidence of central venous occlusive disease (CVD) is 20% to 40%, and up to 60% in end-stage renal disease. The most common risk factor is hemodialysis.^{8,9} Increased flow accentuates outflow obstructions and manifests as debilitating edema. It is a major cause of morbidity and mortality in this population, yet many depend on continued access for kidney disease treatment. First-line management for central venous occlusive disease is angioplasty and/or stent placement.

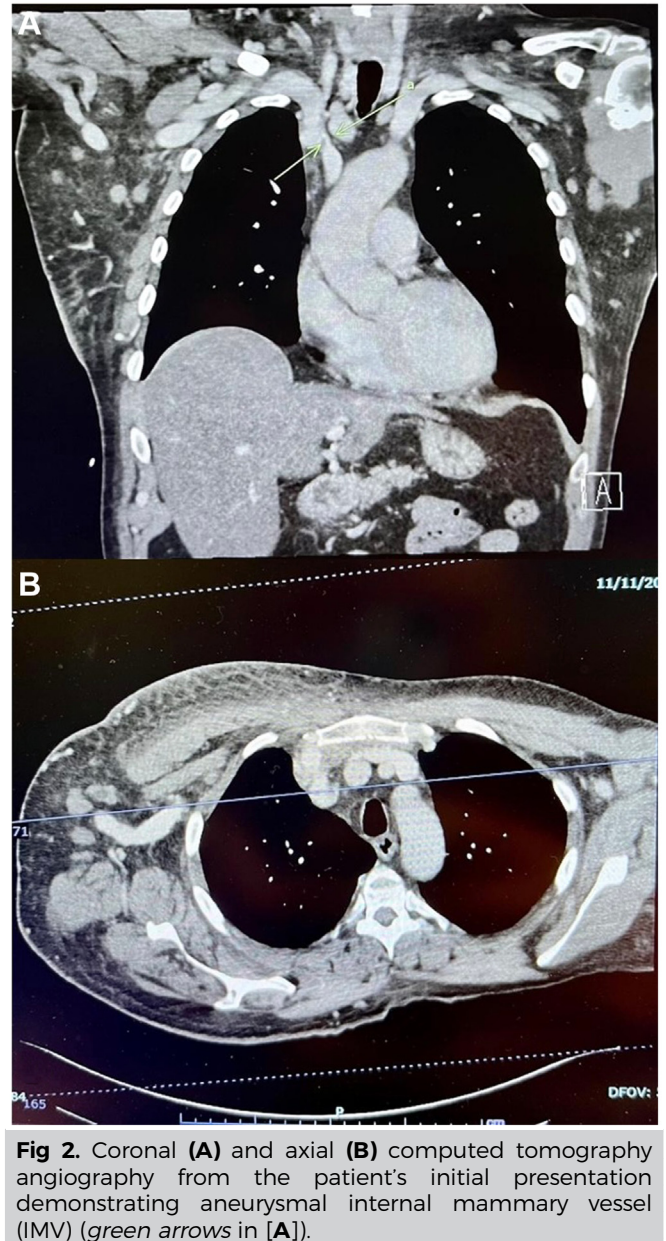


Fig 2. Coronal (A) and axial (B) computed tomography angiography from the patient's initial presentation demonstrating aneurysmal internal mammary vessel (IMV) (green arrows in [A]).

Despite treatment, occlusion recurs.⁹ AVF revision or new access creation is common. No study has determined if stenting or angioplasty is more durable.¹⁰

Central venous PSA is rare following angioplasty, and a paucity of suggested management exists. Three post-catheterization mediastinal vein PSAs have been reported: (1) a 59-year-old female whose fistula became occluded underwent internal jugular vein cannulation, perforating the brachiocephalic vein and resulting in PSA²; (2) a 77-year-old female underwent SVC catheterization for CT after a traumatic fall. The brachiocephalic PSA on imaging may have been secondary to catheterization or trauma¹; (3) a 42-year-old female underwent attempted permacath placement after her AVF became



Fig 3. Patient at follow-up appointment, approximately 1 month postoperatively.

infected. Difficulty passing the wire into the SVC prompted contralateral placement, but subsequent computed tomography revealed PSA of the initial brachiocephalic vein.³ The first two cases used coiling and the third, thrombin injection. Two SVC PSAs after transvenous lead extraction are documented; both patients remained stable, and the aneurysms improved without intervention.¹¹ These patients did not have arterialized venous systems.

The hemodynamically stable, asymptomatic patient with central vein PSA may be treated conservatively with close surveillance.¹ Beyond hemodynamic parameters, larger size, symptoms, and presence of intraluminal thrombus may warrant surgical intervention. Given the presented patient's vitals, progressive and debilitating symptoms, large PSA dimensions (>5 cm), and likelihood of hemorrhage, emergent surgical treatment was indicated. Use of the Amplatzer plug was novel, given the large size of the PSA. After placement, no PSA was identified, so no further intervention was needed.

We report a case of IMV PSA. Post-angioplasty PSAs have been reported in other areas and treated with stents or thrombin injection.^{4,12,13} PSAs of the central veins can have devastating consequences because of the critical structures involved. Individualizing management is paramount to ensure good outcomes. Although stents may prevent bleeding and vessel occlusion, thrombosis and migration into the heart are risked. Thrombin injection may terminate bleeding but must

be limited to the PSA sac. In this case, thrombin injection was not a safe choice. The etiology and location of the PSA must be considered. Ultimately, definitive management is achieved by exercising caution during any catheterization, limiting balloon size, and through careful follow-up if the post procedural venogram suggests an issue.

CONCLUSION

Central venous PSA is a rare complication of angioplasty. We report novel treatment with embolization using an Amplatzer plug.

DISCLOSURES

None.

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