Iatrogenic Post-Catheterization Pseudoaneurysm

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Pseudoaneurysms that occur after catheterization are becoming more common. Some attribute this situation to the use of larger sheaths for intervention and performing endovascular procedures in patients with anticoagulation or platelet inhibition. In the author's opinion, management of this complication is relatively straightforward in most cases, and post-catheterization pseudoaneurysms should be handled primarily by interventional radiologists.

CASE REPORT

A 52-year-old man was referred to the Vascular and Interventional Radiology Section by the transplant surgery service in our hospital for evaluation and management of suspected transplant renal artery stenosis discovered on ultrasound evaluation (Fig. 1). After informed consent, conscious sedation was achieved with midazolam and fentanyl. The right groin was prepped and draped in the usual fashion. Using the Seldinger technique, the left common femoral artery was accessed and a 5F sheath was inserted. Pelvic and selective transplant renal artery angiograms were performed via a 5F RC-1 catheter (Cook, Bloomington, IN), which revealed a tortuous transplant renal artery but no significant stenosis (Fig. 2). The catheter and sheath were removed and hemostasis was achieved using manual compression for ~20 minutes. There was no evidence of a groin hematoma.

On post-procedure day 1, a routine follow-up physical examination showed slight bruising and pain at the puncture site. An ultrasound examination was performed, revealing a pseudoaneurysm anterior to the common femoral artery. Because of the uncertainty regarding anatomical characterization, computed tomographic angiography was obtained (Fig. 3) that showed the pseudoaneurysm extended from a branch of the inferior epigastric artery. A small associated hematoma

was also demonstrated. The patient was returned to the interventional radiology section for further treatment.

Thrombin was prepared by adding sterile normal saline to 5000 U topical bovine thrombin powder (Gen-Trac, Middleton, WI) to achieve a concentration of 1000 IU/mL. Using sonographic guidance, the pseudoaneurysm was punctured with a 25-gauge needle. A small amount of saline was injected under color Doppler ultrasound visualization to confirm needle position in the aneurysm. Subsequently, 250 IU of thrombin were injected into the aneurysm with a 1-mL syringe, resulting in immediate thrombosis (Fig. 4). The patient made an uneventful recovery.

DISCUSSION

Pseudoaneurysms are aneurysms contained by fewer than three layers of the normal artery. They arise from a variety of etiologies including infection, trauma, and chronic inflammation. Any swelling local and pain that occurs after arterial catheterization should be investigated further with either ultrasound or computed tomographic angiography (CTA) to evaluate the possibility of pseudoaneurysm or arteriovenous fistula. Typically Doppler ultrasound is sufficient to make the diagnosis of pseudoaneurysm but CTA provides better overall anatomical definition and facilitates further treatment planning. The hallmark of sonographic diagnosis is the "to-and-fro" waveform at the communication between aneurysm and feeding artery.

Pseudoaneurysms occur in 0.8 to 2.2% of patients after arterial catheterizations. The incidence appears to be growing owing to the overall increase in interventional arterial procedures in which large sheaths are needed. Small (< 2-cm) femoral pseudoaneurysms may thrombose spontaneously, whereas larger femoral pseudoaneurysms require treatment to avoid complications such as rupture and/or compression of the adjacent femoral vein

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Figure 1 Doppler ultrasound of renal transplant. Doppler ultrasound shows elevated velocity in transplant artery.

or nerve. Even smaller asymptomatic aneurysms should be followed with serial imaging to confirm resolution and some (myself included) advocate treating nearly all of them to ensure complete resolution. Common femoral artery pseudoaneurysms are most common after arterial puncture. This patient was atypical because it appeared

Figure 3 Follow-up ultrasound of puncture site. Color Doppler ultrasound examination shows pseudoaneurysm at site of needle puncture. The common femoral artery was remote from the site of the pseudoaneurysm.

Figure 2 Transplant kidney arteriogram. (A) Pelvic arteriogram shows transplanted kidney in right iliac fossa. (B) Left external iliac arteriogram shows tortuous transplant renal artery without evidence of significant stenosis.

Figure 4 Computed tomographic angiography of pseudoaneurysm. Axial images show contrast filling pseudoaneurysm in left groin.

the pseudoaneurysm resulted from a through-and-through puncture of a branch of the inferior epigastric artery. This type of injury is more common after abdominal trauma or iatrogenic puncture for procedures such as paracentesis.

Surgical treatment is currently reserved for aneurysms that do not respond to either ultrasound-guided compression, thrombin injection, embolization, or stent-graft repair. These percutaneous alternatives have obviated the need for open surgical repair in the vast majority of patients. Ultrasound-guided compression is safe and cost effective but has drawbacks including long procedure times, discomfort, and a high recurrence rate in anticoagulated patients. Percutaneous thrombin

Figure 5 Ultrasound guided thrombin injection. (A) Initial color Doppler ultrasound examination shows swirling flow in pseudoaneurysm. (B) Sagittal reconstruction of computed tomographic angiogram illustrates ultrasound-guided thrombin injection. (C) Final color Doppler ultrasound examination after fibrin injection shows no detectable flow in the aneurysm.

injection, first described by Cope and Zeit, has become the therapy of choice, offering rapid procedure times and excellent results (Fig. 5). Typically 250 to 750 IU of thrombin are required to achieve hemostasis, and thrombosis is rapid and nearly immediate. Potential complications include allergy to thrombin and distal embolization. Thrombin injection is generally reserved for narrow necked aneurysms—wide mouth aneurysms are unsuitable for thrombin injection due to the risk of distal embolization. These latter pseudoaneurysms may be successfully treated using covered stents in some instances. If any uncertainty regarding the neck of the

aneurysm exists, it is prudent to obtain CTA or conventional angiography for improved anatomical definition prior to definitive repair.

SUGGESTED READINGS

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