A-V Graft Salvage After Trauma

One center's experience with a malfunctioning upper-arm arteriovenous graft due to trauma and its salvage with an intragraft stent.

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Establishment and maintenance of dialysis access is considered the "Achilles' heel" of dialysis therapy. Arteriovenous grafts (AVG) are commonplace and have a higher morbidity and need for maintenance than the native arteriovenous fistulae (AVF). Access-related expenditure in the US has been estimated to be in the vicinity of $1 billion every year.[1,2] The complications of thrombosis and infection of the AVG are quite common. Failure of the AVG is primarily due to the fibromuscular hyperplasia of the intima at the venous anastomosis of the AVG.[3] Although surgery is still the primary method of restoring the patency of the occluded graft, endovascular therapies, such as percutaneous angioplasty (PTA) and stent placement, are emerging as a means of salvaging the dialysis accesses.[4]

Occlusion of the graft due to external trauma is rare. We report a case of distortion and subtotal occlusion of the upper arm AVG due to trauma to the access extremity. The patency of the AVG was restored by placement of a stent, and invasive surgery was avoided without interrupting the dialysis schedule.

CASE REPORT

A 65-year-old man with end-stage renal disease due to Wegener's granulomatosis had been undergoing regular hemodialysis since 1997. He was receiving warfarin for atrial arrhythmia. A self-sealing, straight, Vectra graft (Thoratec Corporation, Pleasanton, CA) was placed in his right arm in September 2002 due to the thrombosis of his pre-existing forearm loop graft. In November 2002, he fell on his right shoulder, which resulted in avulsion of the head of the right clavicle. He was treated with an arm sling.

Soon after the injury, during dialysis he noticed oozing of dark-colored blood from the site of incision in the right axilla for the venous anastomosis. However, he continued to

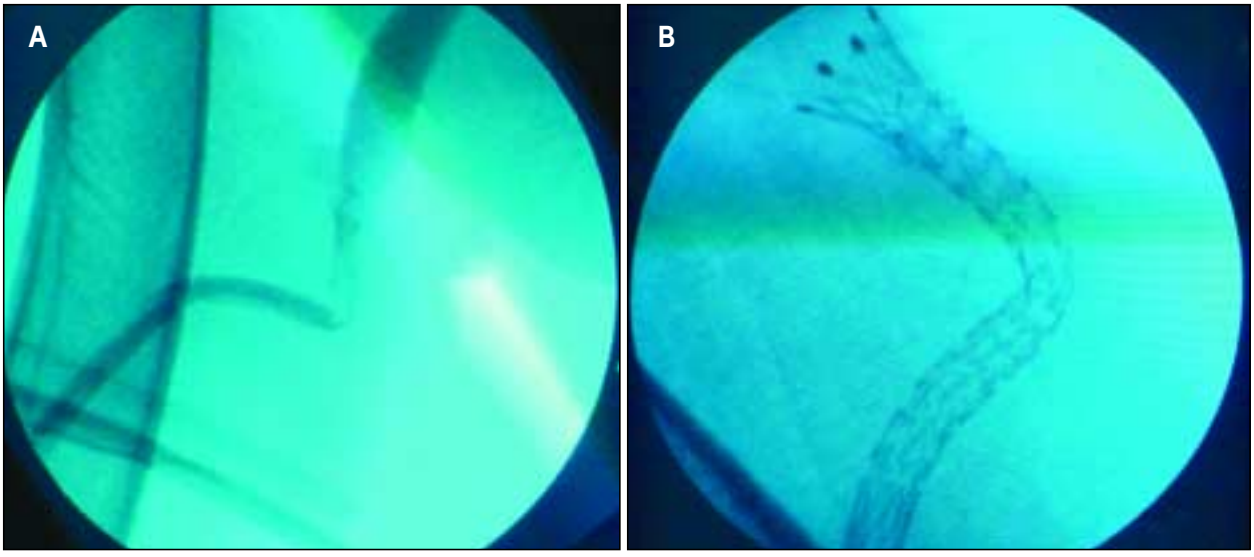

Figure 1. A distorted AVG due to injury of the clavicle (A). There is significant improvement in the configuration of the AVG after placement of an intragraft stent (B).

dialyze with the straight graft, without any apparent problems, but with poor clearances. Due to the continued leakage of blood and the development of azotemia, he was sent for evaluation a week later.

The patient was frail and had lost weight. His vital signs were stable. The examination of the graft showed the presence of a dominantly pulsatile straight upper arm graft, without a bruit. There was a palpable hematoma at the venous anastomotic incision site.

An angiogram of the graft was obtained to evaluate the cause of the hematoma. The graft was found to be severely kinked, making a right angle to the anticipated direction (Figure 1A). There was retrograde filling of the brachial artery, signifying severe obstruction to the blood flow. A Glidewire (Terumo Medical Corporation, distributed by Boston Scientific Corporation) could not traverse the venous anastomosis. A Kumpe catheter (Cook Incorporated, Bloomington, IN) was used to negotiate the kink and a guidewire was placed across the anastomosis. A repeat angiogram now showed a patent vein and good flow through the kinked graft in the axillary area. To restore normal AV graft configuration, an 8-mm X 6-cm Monotherm stent (Bard Peripheral Vascular Inc., Tempe, AZ) was deployed across the lesion, which improved the kink and restored good flow in the graft (Figure 1B). The arm was imaged at different angles to ensure graft patency. Examination of the graft now showed a good, continuous thrill and audible bruit. The graft was used for dialysis successfully, immediately after the procedure.

Approximately 1 year later, the patient had to be hospitalized for respiratory failure. During this period, the graft thrombosed, and he received dialysis from a temporary catheter. After a period of 6 weeks, he underwent a successful mechanical percutaneous thrombectomy and is currently using the AVG.

DISCUSSION

AVG malfunction and thrombosis is not uncommon and results in disruption of dialysis with its attendant complications. Outflow stenosis due to anastomotic narrowing or central vein stenosis is the usual cause of graft clotting. However, to our knowledge, this is the first case report of distortion and dysfunction of a dialysis graft caused by indirect trauma to the access extremity. It demonstrates the vulnerability of the vascular access to otherwise unrelated injuries. Specifically, the distortion of the anatomy in the shoulder area due to bony injury resulted in redundant length of the graft, causing kinking and obstruction. The straight configuration and elastic nature of this particular graft (ie, self-sealing Vectra graft), which normally allows quick hemostasis by close apposition of the graft wall, perhaps predisposed it to significant occlusion from this change in the anatomy. This would have ordinarily required a surgical revision of the graft, but we were able to straighten the graft by placing a stent, making it immediately available for dialysis.

This case highlights the dilemmas in providing uninterrupted dialysis therapy. As was the case with this patient, who was azotemic, it is not uncommon to see patients with no access or malfunctioning access in urgent need of dialysis. Because this patient presented for outpatient evaluation of the access, he would have had to wait to be scheduled for surgery at an available operating room time. Furthermore, the patient was fully anticoagulated and a catheter placement would have been risky and not desirable. Fortunately, he had a self-sealing graft, which decreased the likelihood of substantial bleeding from the puncture sites, as compared to an ordinary PTFE graft.

This case also illustrates the importance of a good physical examination of the vascular access. Interestingly, the patient had continued to dialyze from the distorted access without apparent problems, and the nature of the problem was only recognized by means of an angiogram. The presence of a prominent pulse, the absence of a thrill on physical examination, and a high blood-recirculation value with hemodialysis treatment would have been helpful in the preoperative diagnosis of occlusion of the access.

CONCLUSION

This case further underscores the role of endovascular therapies in the maintenance of dialysis accesses. The AVG in this patient was restored twice: once by the means of stent placement and a second time with percutaneous declotting. Endovascular therapies provide a noninvasive option in the treatment of access-related complications. ■

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1. US Renal Data System (USRDS). 1997 annual data report. National Institute of Health, National Institute of Diabetes, Digestive and Kidney Disease. Bethesda, MD: April, 1997.
2. Eggas PW. Medicare expenditures for vascular access in the ESRD program (syllabus). The Sixth Biannual Symposium on Dialysis access. Miami, FL: 1998.
3. Swedberg SH, Brown BG, Sigley R, et al. Intimal fibromuscular hyperplasia at the venous anastomosis of PTFE grafts in hemodialysis patients: clinical, immunocytochemical, light and electron microscopic assessment. *Circulation.* 1989;80:1726-1736.
4. Weintraub, JL, Rundback JH. Endovascular interventions: fistulography, angioplasty and stents. In: Gray RJ, Sands J (eds). Dialysis Access: A Multidisciplinary Approach. Lippincott, Williams & Wilkins; Philadelphia, PA: 2002;161-169.