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Case Report

An unusual case of fistula formation and thrombosis between arteriovenous graft and a native vein

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Abstract

Arteriovenous graft for hemodialysis vascular access is a widely used technique with many advantages. However, it has crucial complications with graft thrombosis and infection. We recently experienced an unusual case of arteriovenous graft complication involving graft thrombosis related to fistula formation between the graft and the natural vein with infection. We diagnosed this condition using Doppler ultrasound and computed tomography angiography. Successful surgical treatment including partial graft excision and creation of a secondary arteriovenous fistula using an inadvertently dilated cephalic vein was performed. The dialysis unit staff should keep this condition in mind and try to prevent this complication.

Introduction

Vascular access for the patient on hemodialysis (HD) is so important as to be called a lifeline. Although native arteriovenous fistula (AVF) remains a preferred conduit for dialysis access, arteriovenous graft (AVG) using polytetrafluorethylene is a widely used technique with many advantages such as a short duration between placement of the AVG and initiation of cannulation, easy placement, and no need for an adequate superficial vein [1]. However, AVG has crucial complications with graft thrombosis and infection. Vascular access failure caused by thrombosis or infection represents a leading cause of hospitalization in the HD patients, and it is very important to solve these problems to maintain HD.

We report an unusual complication of AVG involving graft thrombosis related to the fistula formation between graft and underlying adjacent vein in the setting of graft infection, and leading to the successful creation of secondary native AVF.

Case report

A 63-year-old man on maintenance HD visited our emergency department for fever and AVG malfunction. He had been previously diagnosed with end-stage renal disease, atrial fibrillation, and hypertension. The patient also underwent AVG with a 6-mm polytetrafluorethylene in his left upper extremity (brachial artery–axillary vein straight type) 23 months earlier. Physical examination showed a blood pressure of 129/60 mmHg, pulse of 84 bpm, respiratory rate of 25 times/min, and body temperature of 38.2°C. The skin surrounding the arterial cannulation site of AVG has cutaneous erythema, swelling, tenderness, and pus discharge. Graft thrill was noted on the arterial limb of AVG, but it was felt weakly on the vein limb. Laboratory testing revealed a white blood cell count of 11,600/mm^3, hemoglobin of 9.0 g/dL, and platelet count of 145,000/mm^3. Arterial blood gas analysis showed pH 7.532, pO_2 59.6 mmHg, pCO_2 24 mmHg, HCO_3 19.7 mmol/L, and O_2 saturation 91%. C-reactive protein was elevated to 18.3 mg/dL.

Vital signs and laboratory findings were consistent with systemic inflammatory response syndrome, and methicillin-

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resistant *Staphylococcus aureus* was documented both in the blood and pus discharge. Therefore, we believed that sepsis was caused by AVG infection. At that time, it was not possible to perform HD using the AVG because the venous site of the AVG was occluded with thrombus. Systemic vancomycin and rifampicin was prescribed for bacteremia, and a temporary double-lumen catheter was placed in the right jugular vein for regular HD.

Imaging studies were performed to evaluate AVG occlusion. Doppler ultrasound (US) identified a subcutaneous abscess around the graft in the antecubital area and a fistula tract between the AVG and the natural cephalic vein at the arterial cannulation level of the AVG. The connected cephalic vein ran parallel to and just under the AVG and was dilated to 13 mm in diameter. The superior aspect of the postfistula graft was totally occluded with thrombus, and intragraft blood flow from brachial artery entirely ran to the connected cephalic vein through the fistula, as shown in Fig. 1. We then noticed that the thrill felt weakly over the upper arm for the first time came from the underlying dilated cephalic vein, not from AVG. Computed tomography (CT) angiography showed the same findings more clearly, as illustrated in Fig. 2. Perigraft infiltration and extravasation of contrast fluid were not shown on CT images. In US and CT images, we could not evaluate the outflow stenosis between graft and axillary vein because the venous limb of AVG had been totally occluded.

Surgical exploration was performed to treat the AVG infection and repair the fistula. Dissection was very difficult because of severe adhesions of the graft and vessel to the soft tissue. After isolating the AVG and vessels, a 2-mm-sized fistula was identified between the posterior wall of the graft and the underlying cephalic vein, as shown in Fig. 3. The fistula tract was separated, and we confirmed that the thrill on the upper arm disappeared. This indicated that the flow to the cephalic vein originated from the fistula.

Partial graft excision from the arterial anastomosis site immediately distal to the fistula and removal of infected tissue were performed. We created a new autogenous AVF by anastomosing the natural dilated cephalic vein to the distal part of the brachial artery (end-to-side anastomosis). We expect that the newly formed AVF will soon be functional because the cephalic vein is already dilated, and the flow is greater than 1,400 mL/min as measured by US Doppler on the 7th day after operation.

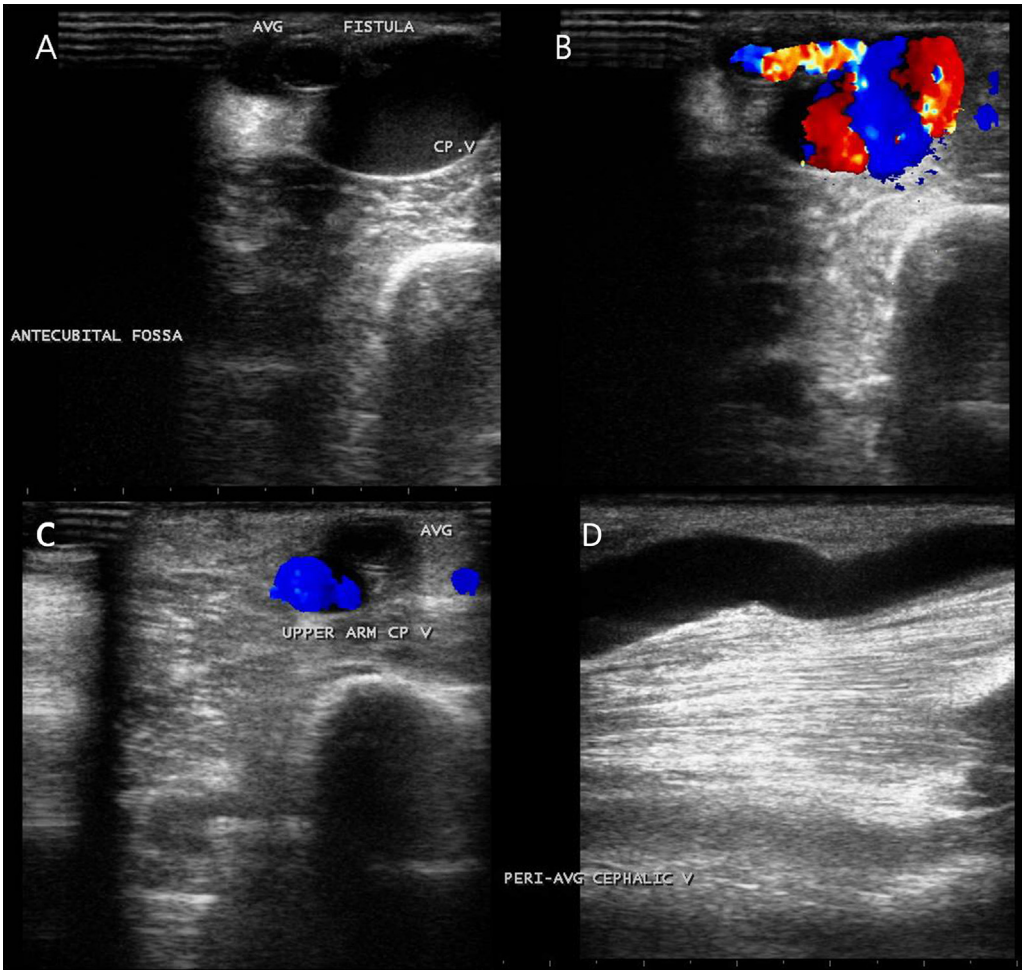

Figure 1. Doppler US findings. (A) Doppler US reveals that the cephalic vein under the AVG was dilated to 13 mm in the antecubital area. (B) It shows blood flow from the AVG to the cephalic vein. (C) On the upper arm, there was no flow in the AVG. (D) In the longitudinal image, the postfistula cephalic vein on the upper arm is dilated to almost 6.9 mm in diameter.
AVG, arteriovenous graft; CP, cephalic; US, ultrasound; V, vein.