Unexpected restoration of an arteriovenous graft function: the significance of vascular access surveillance

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To the Editor

Vascular access failure is a frequent cause of hospitalization and morbidity among hemodialysis (HD) patients [1]. We describe the case of a 30-year-old male who underwent renal replacement therapy since his infancy due to end-stage renal disease caused by posterior urethral valves. During this period, he had four kidney transplants, the last failed 7 years ago. His long history on HD resulted in many attempts for vascular access creation; lastly, he was being hemodialyzed through a left-curved brachio-axillary polytetrafluoroethylene arteriovenous graft (AVG) created 3 years before. Because of the many previous kidney transplants, re-transplantation became surgically challenging; and his panel reactive antibody score of around 90% constrained the possibility of a new kidney graft offer shortly. Thus, the preservation of any existing vascular access was crucial.

Before the first HD session of the week, a non-functioning AVG was noticed. Angiography could not be performed because the angiography apparatus of our hospital was under maintenance. Thus, the surgeon had to use ultrasound to detect the exact site of the AVG occlusion and proceed to thrombectomy. Ultrasound revealed a thrombus close to the anastomosis of the AVG with the axillary vein, and the patient underwent immediate surgical thrombectomy. *Directly after thrombectomy, the patient transferred to the HD unit. Auscultation revealed a non-functional AVG, and paracentesis with 16G needles confirmed the disappointing outcome.* A tunneled central venous catheter (CVC) was inserted in the left jugular vein to permit HD treatment.

As recommended [2, 3], AVG was monitored at any HD session. Before the thrombotic event, no clinical signs of

AVG dysfunction, such as arm swelling, prolonged bleeding, weak thrill, high venous or low arterial AVG pressure, or inadequate urea clearance were detected. However, abrupt thrombosis of an AVG without previous signs of dysfunction is not rare. Notably, 6 months before the thrombotic event, a triplex ultrasound of the patient's left arm showed an AVG blood flow of 1000 ml/min and non-hemodynamically significant stenosis of 35% in the auxiliary vein, 1.5 cm centrally to the AVG anastomosis.

After three HD sessions, the occluded AVG started to pulse again, and auscultation revealed a strong continuous bruit. The AVG was punctured with 15G needles and dynamic venous pressure [4], obtained by the dialysis machine pressure transducer at the beginning of the HD at a blood flow of 200 ml/min, was 170 mmHg. The patient completed a 4-h HD session, and the urea reduction ratio was equal to 67%. In the next day, angiography revealed not only almost complete stenosis of the axillary vein centrally to the AVG, but also the existence of a sizeable collateral blood vessel that circumvents the occlusion (Fig. 1). This vessel acting as a “jump graft” allowed a blood flow through the distal part of the AVG capable of supporting HD therapy. After three successful HD sessions, the CVC was removed, and currently, 5 months after the thrombotic event, the patient continues uneventful HD through the AVG. The last URR was equal to 68%, and the triplex ultrasound showed an AVG blood flow of 850 ml/min.

Such a large neovessel is unlikely to have been developed in the short 10-day period after the AVG occlusion. The neovessel should have been preexisted the thrombotic event and expanded after that. This collateral circulation indicates that significant axillary vein stenosis preceded AVG thrombosis for a considerable period of time, underlining the beneficial role of periodical examination of an AVG in preventing its obstruction. The Vascular Access: 2018 Clinical Practice Guidelines of the European Society for Vascular Surgery (ESVS) recommend that vascular access surveillance should be performed monthly by flow measurement of AVGs [2]. A

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◀**Fig. 1** Angiography detects almost complete stenosis of the axillary vein centrally to the AVG and the development of a sizeable collateral blood vessel that circumvents the occlusion. The photos show the functioning AVG five months after the thrombotic event, as well as the incision of the surgical thrombectomy

flow rate of less than 600 ml/min may indicate an increased risk of AVG thrombosis [2, 3, 5]. *Interestingly, our patient's last triplex ultrasound was 6 months before the thrombotic event. Possibly, a monthly triplex ultrasound would have detected significant stenosis timely.* Implementation of the ESVS recommendations for *vascular access monitoring and surveillance* in clinical practice is pivotal for HD patient well-being and survival and every effort should be made towards this direction.

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Compliance with ethical standards

Conflicts of interest The authors report no conflicts of interest.

Ethical approval All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional review board and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent Written informed consent for submitting this case report was obtained by the patient.

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