

## ARTERIOVENOUS FISTULA FAILURE DUE TO TWO STRAIGHT SHUNTS FORMATION AT DRAINING VEIN

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**Abstract**

A 48-year-old asian man was admitted to hospital for the consideration of hemodialysis (HD). An adequate site was decided on for the AVF after Doppler ultrasonography examination of radial artery and cephalic vein. The AVF was formed under local anaesthetic at his right wrist. When seen at the clinic appointment one month later, the AVF was not working. The subsequent Doppler ultrasonography examination revealed two straight shunts at draining vein. The failure of AVF is due to impaired outflow following reduction of the resistance between draining vein and peripheral venous system.

**Key words:** Arteriovenous fistula; Shunts; Hemodialysis; Ultrasonography; Draining vein.

The National Kidney Foundation Kidney Disease Outcomes Quality Initiative (KDOQI) guidelines for Vascular Access recommend increasing the proportion of arteriovenous fistula (AVF) among hemodialysis (HD) patients (Clinical practice guidelines for vascular access, 2006). Adherence to these recommendations has increased the prevalence of AVF at wrist in Chinese HD patients. A major hurdle to increasing further the proportion of AVF use is the high rate of primary AVF failures (AVF never usable for HD) (Allon *et al.*, 2002). A case of AVF failure due to two straight shunts formation at draining vein is reported.

**Case report**

The patient was a 48-year-old asian man with a history of chronic renal failure. His medication included ferrous sulphate 300mg, three times daily; folacin 10mg, three times daily; rhEPO 3000u, two times weekly; nifedipine, 10mg, three times daily; and salt restriction. He was admitted to the hospital for consideration of HD with the IgA nephropathy as the primary disease. Doppler ultrasonography examination of radial artery and cephalic vein was performed before the operation. The cephalic vein was assessed as suitable (Figure 1) with no shunts found. An adequate site was decided on for AVF.

The AVF was formed under local anaesthetic at his right wrist. The radial artery and cephalic vein were exposed through longitudinal incision. The vein was freed by wide dissection and the collateral branch was ligated with microsurgical clips. A transverse section was made with ligature of the distal branch, followed by a longitudinal veinotomy of the posterior wall of the cephalic vein. The anterior wall of the artery was exposed without any dissection of its trunk. A longitudinal arteriotomy of 15mm in length was made. Then artery-to-vein, side-to-end anastomosis was performed. Attention was paid to avoid twisting the vein. When anastomosis was completed, the tourniquet was released. Additional sutures were added in the case of leak. Hand exercises, such as squeezing a rubber ball at frequent intervals, were recommended in the postoperative period.

After the operation, the fistula functioned briefly. But when seen at the clinic appointment one month later, the AVF was not working. The thrill of AVF to auscultation and palpation disappeared. The subsequent ultrasonography examination revealed two straight shunts at draining vein (Figure 2).



Fig 1 Normal cephalic vein before the AVF operation.

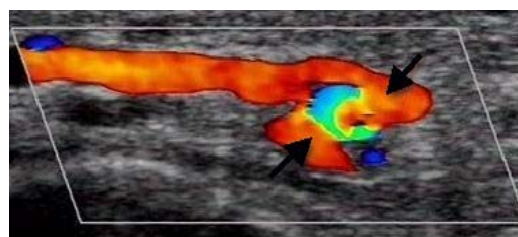


Fig 2 two straight shunts at draining vein (Arrows).

## Discussion

To be used for HD, a newly created fistula must mature; that is, the artery and vein must undergo dilation and remodeling to accommodate a markedly increased blood flow (Chiu *et al.*, 2011). The cephalic vein is followed from its juncture with the axillary vein along the lateral aspect of the arm. The cephalic vein's constant presence and large size made it easy to cannulate as the draining vein. Our case is a previously unreported AVF failure associated with the occurrence of straight shunts at draining vein which were not detected by preoperation ultrasonography examination. The AVF acts as a low-resistance, high-compliance pathway between the high-pressure arterial system and the low-pressure venous system. The venous segment of AVF is characterized by a high blood flow and a low blood pressure level (Nicolaidis, 2000). The vein retains a compliance reserve that preserves the vessel from developing inappropriately high wall stress. Remodelling of the venous wall results from increased circumferential wall tension due to the flow-mediated dilatation (Dixon, 2006).

Blood flow in the various limbs of the fistula will follow the high to low pressure direction. The flow in venous limbs of the fistula will be away from the anastomosis. The small shunts dilated to average the flow contribution from little distal flow to almost equal flow. Shunts of the draining vein reduces the resistance between draining vein and peripheral venous system. As a result, the reduced wall tension leads to unremodelling of the venous wall. The failure of AVF is due to impaired outflow following reduction of this resistance.

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## References

1. Allon M, Robbin ML. Increasing arteriovenous fistulas in hemodialysis patients: Problems and solutions. *Kidney Int*, 2002, 62, 1109-1124.
2. Chiu JJ, Chien S. Effects of Disturbed Flow on Vascular Endothelium: Pathophysiological Basis and Clinical Perspectives. *Physiol Rev*, 2011, 91: 327-387.
3. Clinical practice guidelines for vascular access. *Am J Kidney Dis*, 2006, 48: S176-S273.
4. Dixon BS. Why don't fistulas mature. *Kidney Int*, 2006, 70, 1413-1422.
5. Nicolaidis AN. Investigation of chronic venous insufficiency: A consensus statement (France, March 5-9, 1997). *Circulation*, 2000, 102: E126-63.