



Management of Vascular Access Steal Syndrome after High Flow Arterio-venous Fistula with Revision Using Distal Inflow (RUDI) Technique

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ABSTRACT

Out of 377 patients of end-stage renal disease (ESRD) undergoing hemodialysis through a surgically constructed arteriovenous fistula (AVF), eight patients developed vascular access steal syndrome (VASS) with severe ischemia of the hand on the affected side. Six of these patients were treated with revision using distal inflow (RUDI) technique, in which the fistula is ligated, and an autologous saphenous vein graft is interposed between the disconnected vein and a distal artery. In all these patients, symptoms and signs of hand ischemia regressed whereas flow through the AVF was preserved. We consider RUDI an effective procedure to address VASS because of AVF.

Keywords: Hemodialysis, Limb ischemia, Revision using distal inflow, Vascular access steal syndrome, Vascular access, complications.

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INTRODUCTION

Surgically constructed AVF is an optimal access for hemodialysis (HD) for patients with ESRD. Fistulas with large flows, like those made between a brachial artery and cephalic vein may lead to cardiac overload due to the large left to right shunt and eventually to cardiac failure. Another complication of large flow AVF is VASS. In this condition, arterial flow from the distal upper limb may occur in the retrograde direction and cause hand ischemia.

Depending on the severity of ischemia, the patient may develop cold, painful fingers/ hand, numbness and/or necrotic ulcers. If not treated properly, the patient may lose one or more fingers or even the entire hand. Acute onset VASS occurring within 24 hours needs urgent attention. The fistula will need to be ligated. In chronic VASS, available modalities of treatment are banding or plication of the access vein, tapered graft insertion, distal revascularization and interval ligation (DRIL), proximal arterial inflow (PAI) graft and RUDI. We present our experience with RUDI technique for severe hand ischemia caused by VASS.

MATERIALS AND METHODS

Over a period of 2.5 years (Jan 2015 to June 2017), eight patients were admitted to Department of General and Vascular Surgery, Regional Specialist Hospital, Czestochowa, Poland, with features of VASS due to large flow AVF. All had severe hand ischemia. All these patients had elbow AVFs, constructed earlier between brachial artery and an elbow vein for hemodialysis. Two patients out of these underwent banding of access vein. Remaining 6 patients (two males, four females, mean age 53 years) received RUDI procedure. Preop workup confirmed high flow rates (1400–2900 mls/mt) through the fistula on Doppler studies. In addition, retrograde arterial flow was seen in all cases without any distal arterial stenosis. Radial and ulnar arteries were localized (and marked) by Doppler studies. Wider artery of the two was chosen for RUDI. Ulnar artery was chosen in 4 and radial artery in 2 patients. Under local anesthesia, an incision was made over the previous scar at the site of AVF, and the fistula was ligated. Next, a saphenous vein graft was harvested from leg and anastomosed distally to the artery (ulnar or radial) end-to-side and proximally to the stump of the access vein at the elbow. The artery was exposed through a separate incision.

RESULT

In the immediate postoperative period, all six patients were free of ischemic pain in hand. Hand became warm, and numbness disappeared. They were followed up over next 3 to 6 months. Fistula remained patent in all and was

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Figs 1A to C: (A and B) Ischemic ulcers (arrows) secondary to VASS; (C) Ischemic hand with fingertip necrosis (arrow)

usable for dialysis. All ischemic ulcers healed within 2 to 5 weeks after surgery.

DISCUSSION

Risk factors for VASS after AVF are 1. Inflow through brachial artery instead of radial or ulnar artery, 2. Diabetes 3. Female sex 4. Age over 60 years 5. Smoking. All our patients had proximal, high flow, elbow AVF's supplied by the brachial artery. VASS may occur immediately after construction of AVF or occur several weeks or months later. Acute VASS occurring within 24 hours of surgery needs urgent intervention. These were not included in the current study. All our patients had chronic VASS. Symptoms of hand ischemia were severe. Besides all patients had developed necrotic ulcers over fingers due to ischemia (Fig. 1). All such patients must undergo early surgery. We chose RUDI technique because besides restoring arterial supply to the ischemic hand, the patient continues to have a working AVF which is usable as access for hemodialysis. During the 3 to 6 months follow-up period, we did not encounter complications of thrombosis, stenosis or infection as reported by others.¹ We preferred to use saphenous vein graft in place of synthetic grafts because the use of latter has been associated with thrombosis and

infection.²⁻⁴ The autologous saphenous vein is easily available and is cost effective. It is not susceptible to infection. Its long-term patency is higher than synthetic grafts. Another advantage of RUDI technique is that VASS and cardiac failure are unlikely to occur because inflow is from a distal fore-arm artery (Radial or Ulnar) which is smaller in diameter than the brachial artery (Fig. 2). So very high inflow will not occur.

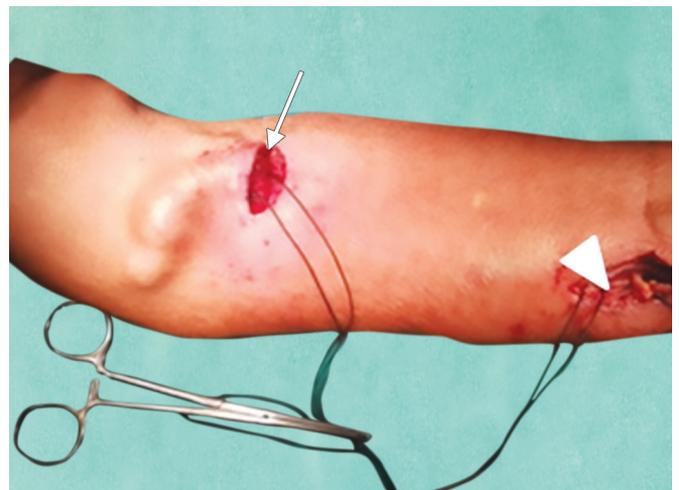


Fig. 2: RUDI procedure: original anastomosis (arrow) and ulnar artery (arrowhead) prepared for distal anastomosis

CONCLUSION

Vascular access steal syndrome (VASS) after high flow AVF is an uncommon but limb-threatening problem in ESRD patients undergoing hemodialysis. It produces severe ischemia of the distal limb. RUDI technique is an effective procedure to restore arterial supply to the ischemic hand and at the same time to maintain access to dialysis.

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