Upper Extremity Fistulogram and Intervention: Benefits of Internal Jugular Venotomy Approach

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Abstract

Fistulogram with intervention is traditionally performed via direct access into the graft or the fistula outflow vein in the patient's upper extremity. Repeated intervention places the fistula/graft at increased risk for pseudoaneurysm, infection, stenosis, or other complications, which may ultimately lead to access site failure. Furthermore, if the intervention fails, there is added cost and risk when a second procedure and access is required for placement of a dialysis catheter. Here we present a case for an alternative approach to performing upper extremity fistulogram, using the internal jugular vein as the access site for intervention on both the fistula and the central venous system. This method results in less risk for injury or infection to the access site related to direct puncture, obviates the need for a second venotomy, and potentially may result in shorter procedure time and less discomfort to the patient.

Keywords: AV Fistulas, AV Grafts, Dialysis, Hemodialysis
Background

A 56-year old male presented with a re-thrombosed left upper extremity brachio-cephalic upper arm PTFE dialysis graft. This was his third such presentation in a 4 month period. The most recent intervention involved catheter-directed mechanical and pharmacological thrombolysis via direct graft access; this was, however, complicated by immediate post-procedural graft re-thrombosis, possibly related to the direct pressure held on the puncture site of the graft to prevent bleeding. Therefore, decision was made to intervene upon the graft using an alternative access site. The ipsilateral internal jugular vein was chosen as a site for intervention on both the graft and the central veins, providing also a site for placement of a temporary dialysis catheter should the intervention fail.

Clinical Findings/Procedure Details

After confirming patency of the patient’s left internal jugular vein with ultrasound, sterile preparation of the left neck and was successfully performed and a small amount of local anesthetic administered; conscious sedation was not required. Using Seldinger technique, a 7 Fr. sheath was placed in the left internal jugular vein. Central venogram via a 5 Fr. Kumpe catheter (Cook Group, Bloomington, Indiana) showed high-grade stenosis of the left innominate vein; this was treated with balloon angioplasty using a 12.0 mm x 60 mm Evercross (Covidien Ltd., Dublin, Republic of Ireland) balloon (Fig. 1). Using the Kumpe catheter, a 0.035 inch stiff angled Glidewire (Terumo Corporation, Tokyo, Japan) was then advanced in the opposite direction into the graft in the patient’s left upper arm. Retrograde access into the graft was successfully achieved and fistulogram showed thrombus throughout the graft. Thrombectomy of the graft was performed with a 6 Fr. AngioJet rheolysis catheter (Boston Scientific, Natick, Massachusetts) with 10 mg of tissue plasminogen activator administered. Repeat fistulogram demonstrated a moderate stenosis of the graft-vein anastomosis; this was successfully dilated with a 6.0 mm x 40 mm Evercross balloon (Fig. 2).
Figure 1: Balloon angioplasty of left innominate vein stenosis.

Figure 2: Angioplasty of stenosis at graft-vein anastomosis via internal jugular venotomy approach.
Final fistulogram showed a patent graft fistula and central venous outflow (Fig. 3). Prior to removal of the access, the fistula was examined and noted to have a palpable thrill; dialysis catheter placement was therefore not needed. The sheath was removed without complication. The patient was able to have dialysis via the graft within 24 hours of the procedure. There was no post-procedural infection or bleeding. The graft remained functional in one-month follow-up after the procedure.

Discussion:

Endovascular intervention for treating failing upper extremity graft fistulas has been traditionally performed via the well-described cross-catheter technique, whereby the native fistula or prosthetic graft is directly accessed with catheters facing the antegrade and retrograde direction (1-3). This approach has some disadvantages, however. It places the operator’s hands in the field of imaging, theoretically increasing exposure from scatter radiation. Direct puncture with sheath placement in the fistula or graft can lead to access-site complications such as infection or pseudoaneurysm, and may increase procedure time related to holding pressure to stop bleeding at the puncture site. Furthermore, repeated puncture may lead to fibrous scar formation within a prosthetic graft and subsequent graft failure.

Alternative methods to accessing upper extremity dialysis fistula and grafts via remote access sites have been described in the past. Rabellino et al describe endovascular method for graft pseudoaneurysm repair using an ipsilateral jugular venotomy approach (4). In a case series of 24 patients (31 procedures), Zaetta et al describe central venous access into thrombosed dialysis grafts; in some cases, this included using a snare catheter inserted via direct graft puncture to pull the jugular venotomy wire through areas of difficult-to-navigate stenosis in the graft (5). In a series of 48 thrombosed radial-cephalic fistulas in the forearm, Wu et al demonstrated the technical feasibility and low complication of accessing via the ipsilateral radial artery (6).
The importance of developing alternative approach to extremity fistulogram is further underscored with the development of new stent-grafts for treatment of graft stenosis (7, 8). Stent grafts which have been studied for this use include the Fluency stent graft (Bard Peripheral Vascular, Tempe, Arizona), Wallgraft (Boston Scientific), SMART stent (Cordis, Bridgewater, New Jersey), or Viabahn stent graft (W.L Gore & Associates, Flagstaff, Arizona) (9). These stents require the order of 6-9 French sheaths, which may not be optimal for direct graft access in patients with greater risk for bleeding, such as those undergoing thrombolysis with TPA or those on anti-platelet or anti-coagulation medications. Central venous access for placement of these stent grafts, such as the jugular venotomy access illustrated in this case, would reduce this risk for bleeding and potential graft re-thrombosis from prolonged duration of direct pressure held on the graft required to prevent post-procedure bleeding.

In practice, the ideal approach to treating a thrombosed fistula or graft would also include addressing any central venous stenosis which could affect graft outflow at the same setting as intervention for graft stenosis, thrombosis, etc. This would include balloon angioplasty or salvage with a stent in cases of refractory stenosis. Similar to the stent-grafts for treatment of graft stenosis, stents utilized for central venous stenosis require a large caliber sheath for placement which may not be suitable for direct graft access. As demonstrated in this case report, the jugular venotomy approach, in addition to allowing for access into the graft, also allows for short and direct access into the central venous anatomy and as such is more feasible than radial arteriotomy, femoral venotomy, or subclavian venotomy in achieving this. This case report highlights that the technicalities of treating both central venous stenosis as well as graft thrombosis in the same setting is technically feasible and safely performed via a jugular venous approach, without requiring additional access into other veins, arteries, or the graft itself.

**Conclusion:**

Traditional approach to upper extremity dialysis intervention has been via direct access into the graft/fistula, while alternative approaches have been described in small case series and reports. With more advanced techniques for endovascular management of hemodialysis access being developed, including stent-grafts for in-graft stenosis, the need for alternative methods of intervention is becoming of greater importance. Fistulogram using an internal jugular approach is a feasible alternative for minimizing risk incurred by repeated intervention via direct access into the graft or fistula. In this case report, this approach is demonstrated to not only provide a means for intervening in the dialysis access, but allows for concomitant intervention into the central venous anatomy.
References


