Preliminary experience with percutaneous interventions on thrombosed “HeRO” AV grafts

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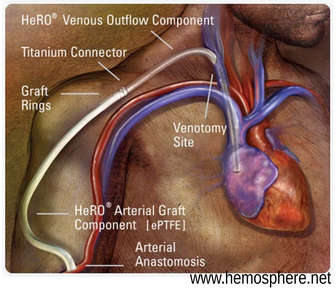
Introduction

•Adequate Arteriovenous hemodialysis access is critical to the survival of patients on hemodialysis.
•Autogenous and PTFE AV grafts are the mainstays of access, yet are dependent on central venous patency.
•Hemodialysis Reliable Outflow (HeRO) Vascular Access Device (Hemosphere Inc, Minneapolis, Minn) was approved by the United States FDA as a graft for use in ESRD patients in whom peripheral venous access sites have been exhausted (Katzman 2009).
•The purpose of this single center, retrospective study was to review our experience with percutaneous interventions on thrombosed HeRO AV grafts for etiologies of thrombosis and post-interventional outcome.
•Additionally, we describe a novel method of declotting the thrombosed graft in the absence of catheter dysfunction.

HeRO Graft

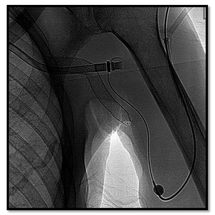


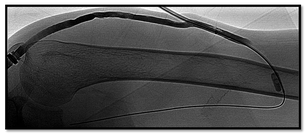
www.hemosphere.net

There are two components to the HeRO graft . The venous outflow component is a 5 mm silicone catheter which is placed through the stenosed or occluded central veins with the distal tip placed at the caval/atrial junction, thus eliminating a venous anastomosis. The arterial graft component is a 6 mm ePTFE graft which is attached to the artery utilizing a standard arterial anastomosis. The graft is tunneled in a superficial soft C-curve (to maximize area of cannulation) and is attached to the venous outflow component.

Materials and Methods: Single access thrombolysis

•7 F sheath is directed towards the arterial anastomosis.
•An occlusion balloon is partially inflated in the artery and the fibrin plug and clot is pulled back to the sheath.
•The occlusion balloon is deflated and the sheath and occlusion balloon are pushed forward in tandem.
•Occlusion balloon re-inflated to protect the artery, saline is forcibly injected into the sheath, pressurizing the graft and clearing the venous side of the graft.





Materials and Methods: Patients

•A total of 26 patients underwent surgical HeRO device insertion at our institution between July 2008 and August 2009.
•Of these patients, five (table 1) presented with a thrombosed HeRO graft for percutaneous intervention for a total of 11 interventions.
•The images and procedural details of these interventions were reviewed, as well as the associated clinic notes.

Table 1: Patient demographics

	Patient Age at Surgery	Location of arterial anastomosis	Date of surgery	New Thrombolysis technique
Patient 1	44	Left SFA	7/9/2008	Y
Patient 2	31	Left Brachial	8/13/2008	Y
Patient 3	74	Right Brachial	2/2/2009	N
Patient 4	59	Left brachiobasilic vein cuff	3/3/2009	Y
Patient 5	66	Left Brachial	9/15/2008	N

Results

•First-time thrombosis of the HeRO graft occurred at a mean of 150 days (range 51-321 days).
•Of the 11 interventions, 5 resulted in durable patency of greater than 4 weeks (mean 135 days, median 116 days). In these durable interventions, angioplasty was performed three times (pts 1 and 4), fibrin sheath disruption was performed in one (pt 1), and declotting without additional intervention was performed in two (pts 3 and 5).
•Of the 6 interventions with recurrent early thrombosis, declotting without additional intervention was performed three times (pts 1 and 5), angioplasty was performed in two patients (pts 2 and 3), and intragraft stenting was performed in one (pt 2).

Table 2: Interventions

	Graft age at intervention	New technique?	Pathology	Intervention (beyond mechanical thrombectomy and tPA lysis)
Patient 1	321	Y	mild-mod stenosis venous limb vs adherent clot	none
	334	Y	mild IVC stenosis, mild-mod stenosis venous limb vs adherent clot	IVC angioplastied to 14mm
	380	Y	fibrin sheath, mild-mod stenosis venous limb vs adherent clot	plasty fibrin sheath, plasty graft to 6mm
Patient 2	163	Y	mild-mod stenosis venous limb vs adherent clot	plasty to 7mm
	168	Y	mild-mod stenosis venous limb vs adherent clot	7mm x 6cm Fluency stent
Patient 3	114	N	unknown	plasty throughout to 6mm
	130	N	unknown	none
Patient 4	51	Y	mod-severe stenosis at art anast	plasty to 6mm
Patient 5	99	N	mild-mod stenosis venous limb vs adherent clot	none
	106	N	mild-mod stenosis venous limb vs adherent clot	none
	113	N	mild-mod stenosis venous limb vs adherent clot	none

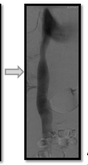
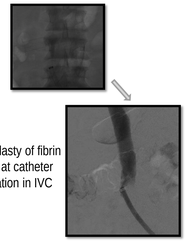
Table 3: Outcomes of Interventions

	Graft age (days) at intervention	Endpoint	Status	Patency from prior intervention (days)
Patient 1	321	6/8/2009		13
	334	7/24/2009		46
	380	10/5/2009	current	73
Patient 2	163	1/28/2009		5
	168	2/17/2009	abandoned	20
Patient 3	114	6/12/2009		16
	130	10/6/2009	current	116
Patient 4	51	10/6/2009	current	166
Patient 5	99	12/30/2008		7
	106	1/6/2009		7
	113	10/6/2009	current	273
Average	180			67

Results: Lesions and interventions

Interventions for patient 1



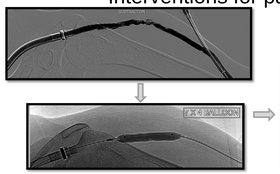



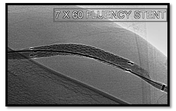
Adherent clot/stenosis. Resolved with thrombectomy and/or angioplasty to 6 mm (3 episodes)

Mild IVC stenosis (angioplastied to 14 mm)

Angioplasty of fibrin sheath at catheter termination in IVC

Interventions for patient 2

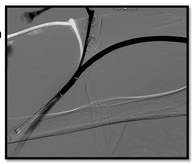
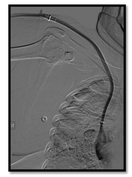




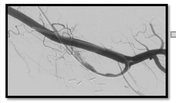
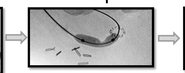
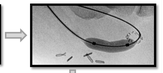
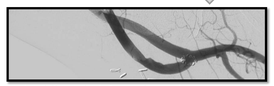
Persistent stenosis/adherent clot which did not resolve with angioplasty (2 episodes). 7 x 60 mm Fluency stent.

Interventions for patient 3

Angioplastied the graft to 6 mm empirically. No stenosis identified status post thrombectomy. No images from OR thrombectomy.

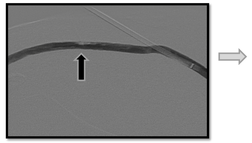
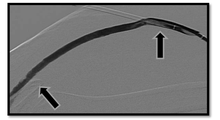
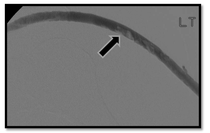
Interventions for patient 4

Brachiobasilic vein cuff stenosis at the arterial anastomosis. Resolved with angioplasty to 6 mm.

Results: Lesions and interventions

Interventions for patient 5

Three episodes of adherent clot/stenosis which were treated with repeat thrombectomy and chemical lysis.

Discussion

• Of utmost importance is that the catheter tip terminates at the caval/atrial junction. If the catheter tip is left short, this potentially increases the risk for fibrin sheath formation and dysfunction of the catheter tip (Pt. 1).
• Intragraft stenosis/adherent thrombus appears to represent the most common abnormality now that the venous anastomosis has been eliminated. The more proximal you can place the arterially directed access, the higher the success of treating the area of stenosis/clot with one access.
• With the HeRO graft, a cause of thrombosis is not always identified (pts 3 and 5) or the intragraft stenosis is “mild-moderate.” One theory is that the additional length of synthetic material with a lumen of 5-6 mm provides a more thrombogenic environment than the typical PTFE graft. The current practice of our vascular surgery department (JL, SG) is to place the patient on Plavix to prevent thrombosis events. Future studies to determine whether this is critical are underway.

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Reference: Katzman HE, McLafferty RB, Ross JR, Glickman MH, Peden EK, Lawson JH. Initial experience and outcome of a new hemodialysis access device for catheter-dependent patients. J Vasc Surg. 2009 Sep;50(3):600-7

Disclosures: None