Management of a Partially Dislodged Embolization Coil in an Arteriovenous Fistula for Dialysis Access

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Abstract
Coil embolization is used to obliterate accessory veins arising from hemodialysis access sites. This improves blood flow in the fistula, clearance, and a better Kt/V can be achieved on a hemodialysis (HD) machine. Coil dislodgement and migration to the central venous circulation or non-target vessels can occur. Currently the management of coil migration is operator and case dependent. We report a case involving a dislodged coil after attempted accessory vein embolization. The coil partially migrated into the main outflow channel of a radiocephalic hemodialysis fistula. The coil was surgically removed by creating an opening (venotomy) of the accessory vein and manually extracting the coil, all while keeping the access functional and without the need for any hemodialysis catheter.

ABBREVIATIONS
HD: Hemodialysis; AVF: Arterio Venous Fistulas; DHIS: Distal Hypoperfusion Ischemic Syndrome

INTRODUCTION
Coil embolization is a minimally invasive procedure that is used for endovascular occlusion. It has been used by interventional nephrologists and other practitioners to embolize accessory veins in order to salvage low blood flow or non-maturing Arteriovenous Fistulas (AVF) in hemodialysis (HD) patients. Complications of coil embolization include infection, pain, perforation, and in rare cases migration to non-target vessels or the central venous circulation which can have devastating outcomes. Once coil migration has occurred the question of how to manage the adverse effect arises and although there are absolute and relative indications for removal, the decision in regards to the method of removal is operator dependent.

CASE PRESENTATION
We present a case of a 59 year old female with end-stage renal disease secondary to hypertension on hemodialysis (HD) three times a week via left forearm Radial Cephalic fistula. She was referred to our vascular access center for poor blood flows in the left forearm access and also symptoms of mild steal syndrome in the left hand. Distal hypoperfusion ischemic syndrome (DHIS), which is often referred to as “steal syndrome”, occurs in approximately 5-10% of cases when using the brachial artery for arteriovenous fistula (AVF) formation [1,2]. A fistulogram was done and showed a 70% stenosis at the juxta-anastomotic area with poor distal arterial blood flow to the hand. There was also a large accessory vein arising from the lower arm fistula. We planned to embolize the accessory vein to improve blood flow in the fistula as opposed to opening up the Juxta area which could potentially worsen her steal symptoms. Our approach was intended to increase the blood flow through the patient’s fistula and not aimed to treating the symptoms of her steal syndrome. We planned to embolize the accessory vein to improve blood flow in the fistula as opposed to opening up the Juxta area which could potentially worsen her steal symptoms. Our approach was intended to increase the blood flow through the patient’s fistula and not aimed to treating the symptoms of her steal syndrome. The accessory vein was selectively catheterized and a 8mm by 5 cm COOK Mreye embolization coil was deployed. Due to technical difficulties encountered during the coil placement, part of the coil was found to be protruding into the fistula (Figure 1), however there was still flow in the fistula. She was advised to continue to use the fistula for HD which she did without any issues for approximately one month but then returned again with decreased blood flow on transonic monitoring [3,4]. At this time a repeat angiogram showed a large part of the coil protruding in the body of the fistula with decreased blood flow and there was a high risk of clotting. At this point we felt we had the two
following options to deal with the coil migration. First was to use a snare and try to completely dislodge the coil and pull it into the body of the fistula and then remove it via a vascular sheath. The second option was to open up the accessory vein surgically and remove the coil by pulling it through the accessory vein and then ligating the accessory vein to improve blood flow in the fistula and preserve this arteriovenous access. We decided to proceed with percutaneous retrieval, which was performed successfully without any complications as seen in (Figure 1,2).

DISCUSSION

There are several factors that can lead to coil migration including rapid blood flow, premature deployment of the coil, and a size disparity between the coil and vessel diameter. For venous embolization it has been proposed that the coils be upsized to 20%-100% of the diameter of the vessel [5]. In regards to our case, you can see the accessory vein had an acute angle (Figure 1). When we guided our catheter with the loaded coil to the accessory vein, the catheter did not completely traverse the acute angle and we believe that coil deployment was perhaps initiated prematurely. About 60% of the coil was in the main channel of the fistula and the rest in the accessory vein. Once coil migration has been established the question of how to proceed arises. In the current literature there are relative and absolute indications for percutaneous retrieval of foreign objects. The former includes pain and thrombosis, while the latter includes active infection (sepsis), high risk of embolization to a vital structure, high risk of perforation, and foreign body entrapped in a large vessel [6]. Not every foreign body requires removal, and the decision to remove depends on the risk-benefit ratio and careful assessment of every individual case [7]. Expert opinion tends to recommend conservative management with periodic follow up if the patient remains asymptomatic [3]. We believed this was the best management for our patient which is why initially we left the migrated coil in place and had the patient resume her regular HD. However, when she returned and a repeat angiogram showed decreased blood flow and coil protrusion into the fistula we thought the risk of clotting was very high and warranted retrieval. Historically successful coil retrieval with a micro snare can usually be done in vessels with diameters ≥3mm and is significantly easier if the coil is open, with an accessible proximal or distal end [8,9]. The risks with this procedure include complete embolization of the coil into the central venous circulation or failure to remove the coil leading to loss of access and also inability to direct the snare into the accessory vein.

There are numerous tools available for the retrieval of foreign objects. Devices range from wire loop snare, retrieval basket, forcers, pincher devices, and balloon catheters [7]. When deciding on a device to use, factors like location, the type of foreign body, and operator preference are important. Snares still remain the most widely used devices for extraction, however a potential con to its use is its expense. To date, the use of an EN wire-loop snare device for coil retrieval at our access center ranges from 1500 – 2000 dollars. On the other hand surgical ligation of accessory veins and percutaneous retrieval remains a viable option, especially in cases where the accessory veins are superficial. Surgical removal and subsequent ligation of that accessory vein can be both cost-effective and improve the flow through the fistula. As mentioned in Shah and Agarwal [7], cut down surgical ligation of deeper accessory veins can be complicated by injury to nerves, muscles and tendons. In these cases, percutaneous intervention via the retrieval devices listed above maybe more appropriate.

We present an alternative way to deal with a complication of a partially dislodged embolization coil in the main channel of the fistula outflow. While our approach may not be novel, it is an alternative approach to surgical revision and snare removal. Surgical revision would require the patient to have an interim
dialysis catheter and snare removal can be costly. Our method of percutaneous retrieval was both successful, cost effective, low risk, and had good outcome. The purpose of our article was to highlight an under-utilized method of coil extraction in the field of interventional nephrology. Further research is required to help delineate the success rate of therapy with venotomy.

REFERENCES


