Safety and Feasibility of Office-Based Endovascular Procedures

Lessons learned during a 6-year experience performing dialysis access and vascular interventions in an office setting.

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Since 2005, more than 250 office-based endovascular procedure centers have opened in the United States. These operations may be carried out by vascular surgeons, cardiologists, radiologists, and interventional nephrologists. Most of the procedures are related to establishing and maintaining dialysis access in patients with end-stage renal disease; however, an increasing number of procedures are being carried out to manage chronic limb ischemia. In addition, superficial venous disease is widely treated in an office-based manner. In some of the office-based endovascular suites, cardiac procedures like pacemaker/defibrillator implantation and coronary angiography are performed for patients with private insurance. Unfortunately, there is a dearth of data in the literature about the safety and feasibility of doing these endovascular interventions in an office setting.

OUR EXPERIENCE WITH OFFICE-BASED ENDOVASCULAR INTERVENTIONS

We opened our center in 2007. It took us 6 months of planning and then 6 months of construction to start the center. Prior to this, we began performing interventions on patients with chronic venous insufficiency in the office. Site planning included visits to other centers and interviewing other practitioners before embarking on our venture. Once construction was complete, we started performing dialysis-related percutaneous procedures. Gradually, we increased the scope of intervention and can now perform virtually every percutaneous procedure in the office, excluding endovascular repair of abdominal aortic aneurysm and carotid stenting.

Since our inception, we have performed 7,636 procedures between May 2007 and November 2013. The distribution of these cases is listed in Table 1. The most common procedures are those related to maintaining dialysis access. Arterial imaging and intervention can easily be performed in the office access center with excellent results. We have performed more than 1,300 venous interventions, ranging from filter and port placement to endovenous ablations and microphlebectomies.

PREVENTING AND MANAGING COMPLICATIONS

It is a given that there will be complications if enough procedures are performed in a center. The goal is to minimize complications and manage them appropriately when they do occur. A culture of safety starts even before the center opens, and teamwork is essential. Resources in the office are limited compared to the hospital, but should not be a factor in compromising safety. In fact, having fewer individuals involved in interventions may improve continuity of care. All the tools necessary to manage procedure-related emergencies need to be available. Every physician and nurse needs to be Advanced Cardiac Life Support certified. There needs to be protocol for conscious sedation, and the team should work together to develop and practice emergency protocols.

There are certain things that need to be done by the physician leader of the team. While choosing cases and performing the procedures, be aware of the resources you have in case of a complication. Act as a mentor to new associates so that they are familiar with the resources in the office, which may be different from the hospital. All of the safety measures practiced in a hospital setting (ie, infection control, injury prevention, radiation safety, etc.) apply in the office. The patient is evaluated immediately before the procedure, venous access is established in those undergoing conscious sedation, renal function is checked, and intravenous hydration is performed prior to arterial procedures. Almost invariably, we perform all dialysis-

TABLE 1. DISTRIBUTION OF TREATED CASES SINCE MAY 2007

Procedure	Number
Fistulography	
Fistulography	352
Fistulography, thrombectomy	678
Fistulography, intervention	2,281
Angiography	
Aortography, runoff	633
Aortography, runoff, intervention	480
Cerebral angiography	5
Catheters	
Removal	900
Insertion	470
Exchange	343
Catheter angiography	3
Venous	
Endovenous laser therapy, microphlebectomy	573
Endovenous laser therapy	439
Microphlebectomy	123
Radiofrequency ablation	4
Radiofrequency ablation, microphlebectomy	3
Venography	
Venography	63
Venography, intervention	8
PowerPorts (Bard Access Systems, Salt Lake City, UT)	
Insertion	160
Removal	40
Exchange	4
PowerPort angiography	1
Inferior Vena Cava Filters	
Filter removal	50
Filter placement	23
Total Procedures	7,636

related procedures under local anesthesia. During the procedure, the correct patient and site are confirmed. Fluids are labeled to avoid confusion, and vital signs, including pulse rate, blood pressure, and oxygen saturation, are continuously monitored.

If the procedure is being performed by a physician without a surgical background, there should be an agreement with a local hospital to accept the patient if there is a complication. We presume that the vascular surgeon has privileges at a local hospital and can treat surgical complications that could occur. Adequate supplies in the office are required (eg, a crash cart, suction, and covered stents) in case of bleeding complications.

There are patients who are not candidates for office-based procedures. In our experience, these are patients who weigh > 400 lbs, those who have severe anxiety or poor pain tolerance, those with severe dye allergy, those with a previous bad experience in the center, or those who fall in the American Society of Anesthesiologists category 4. We keep a running list of patients who cannot undergo a procedure in the office. Only about 4% of patients who have end-stage renal disease are not candidates for procedures in the office. Occasionally, a patient who had a bad past experience because of poor pain control under local anesthesia in the office will come back to the office for a procedure when we offer conscious sedation. Almost invariably, we perform all dialysis-related procedures under local anesthesia. We have been able to minimize complications by following the guidelines we have created for our center.

Many complications can be avoided by using proper technique in entering and exiting the vessel. Ultrasound and fluoroscopy are widely used to gain appropriate access. It is imperative that a femoral stick not be too high or too low, and thorough hemostasis at the end of the procedure is essential. After dialysis access procedures, hemostasis can be achieved within 5 minutes or so using direct compression. A suture may be required if a larger sheath is used or if there is venous hypertension. Commercial products are available for groin hemostasis after angiography, although 10 minutes of direct compression may be the most cost-effective method. Venous interventions, including microphlebectomy, rarely require more than a few minutes of pressure.

During an intervention, it is important to keep the guidewire inside the vessel. Even an angled soft-tip wire can puncture a muscle or visceral branch. Care must be taken not to oversize the balloon for angioplasty. On the other hand, stents, particularly in dialysis cases, must be appropriately oversized to prevent migration.

In our experience between May 2007 and December 2012, we have had 54 (0.8%) total complications in 6,458 procedures.[1] Approximately 80% of these were medical issues such as hypotension, hypoxia, or nonsurgical bleeding. The breakdown for complications for different procedures is as follows: aortography (1%), aortography with intervention (2.7%), venous (2.2%), fistulography (0.5%), catheters (0.3%), and venous filters (0.2%). Our biggest fear is experiencing a complication in the office and not being able to manage it. To date, this has not occurred. We have been able to stabilize the patient and send him/her to the emergency depart-

ment. During this period, we transferred 26 patients to the hospital where we have privileges. Only 10 patients needed operative intervention. There was no death or limb loss as a result of a complication. There was also no procedure-related death in the 30-day postprocedure period.

As confidence has increased, we have noticed that more and more interventions originally confined to the hospital setting can be done in the office. With safety and efficacy demonstrated in the office-based access center, additional benefits include decreased hassle for the patient and physician, as well as decreased cost to the health care system.[2]

CONCLUSION

It is safe and feasible to perform most endovascular procedures in the office. For venous procedures, the office has become the main site for treatment. Almost all dialysis access–related procedures can be performed in the office setting, and an increasing number of patients with chronic limb ischemia will also undergo invasive treatment in this setting. ■

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