Craig R. Greben, MD

Interventional radiologist Craig R. Greben, MD, discusses technology selection, unique cases, and the wide range of applications for embolization.

How do you select the ideal embolization option for a given case? To what extent is it patient- or disease-specific versus a matter of personal preference toward a particular technology?

For me, the overarching dictum is patient safety. As a practicing interventional radiologist, I treat every patient as if he or she were a family member. Peripheral embolization technology has progressed significantly in the last 5 years. Detachable coils, which have traditionally only been available for cerebrovascular embolizations, are now available to peripheral interventionists. This technology has significantly expanded the treatment pool of patients I can intervene on safely. I offer my patients the best treatment option and embolization technique and technology available. I choose the embolic agent based on the disease entity, target morphology, and personal preference; I tend to use agents that I am most comfortable with because this ensures the safest, most successful outcome. I have become particularly comfortable with detachable coil technology and acrylic through collaborative efforts with our neurointerventional radiologist, Dr. Avi Setton, and if the risk or sequelae of nontarget embolization is too high (such as in high-flow arteriovenous fistulae or wide-necked aneurysms), I tend to use detachable coils either alone or in combination with pushable coils and acrylic.

As opposed to some other endovascular therapies that involve placing essentially one device, embolization procedures commonly involve the administration of many tiny pieces of material. With each particle or coil increasing the cost of the procedure incrementally, how do you know when to abandon the attempt and convert to another approach, such as open surgery?

This is becoming a medical and ethical dilemma. And it is a loaded question that has everyone in medicine stewing. It begs several questions. Is open surgery, with its generalized increased morbidity compared to minimally invasive procedures, less costly? Are we at the point of "care rationing" that we would subject our patients to lesser, more invasive care because it is less costly? Thankfully, so far I have not been asked to subject my patients to open surgery in lieu of superior endovascular or minimally invasive therapies when appropriate.

How would you describe the current state of patient awareness of uterine artery embolization (UAE) as opposed to hysterectomy? How does this compare to 5 years ago?

Scant. Interventional radiology, interventional radiologists, and UAE all suffer identity crises. Although patient awareness about UAE improves yearly and has improved modestly over the last 5 years, it has a long way to go to truly compete with hysterectomy when it comes to familiarity. Every woman knows what a hysterectomy is. Few women know what UAE is. Women are very savvy about health care. They will surf the Internet and speak to their family, friends, colleagues, acquaintances, even strangers, about intimate health issues. This certainly helps raise awareness. Time will tell if this is enough. Women are also proactive with regard to their health care. Many of our UAE patients are self-referred. Although UAE must be mentioned during the informed consent discussion for hysterectomy/myomectomy, I am not sure what the compliance is and how it is really presented. There are still many misconceptions about fibroid embolization, even in the professional community. It is really a remarkable procedure.

In your practice, how have you been successful in generating patient referrals? Treating everything from

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EVAR endoleaks to stabbing victims to arteriovenous malformations, the sources seem to vary quite significantly.

As I mentioned earlier, the new coil technologies have expanded the pool of patients we can successfully treat. Success breeds success. My success has been the result of quality work, multidisciplinary approach to cases, excellent service, and round-the-clock availability.

What is the most unusual case you have treated using embolization? What were the details of the case?

Several years ago, a middle-aged woman with bilioptysis (the expectoration of bile) was referred to me for possible treatment. A liver metastasis had been resected 2 years earlier, which resulted in a bronchobiliary fistula. She had been treated with traditional therapeutic options, including medications, sphincterotomy, and biliary stenting. None of these therapies worked, and she continued to cough up bile around the clock. She failed to thrive and had become cachectic. We thought if we could catheterize the fistulous tract, we could possibly embolize it. Endoscopic access to the tract was unsuccessful. Using fluoroscopic guidance, I navigated a 5-F catheter down the trachea into the right lower lobe bronchus. Contrast injection opacified the fistulous tract to the biliary tree. Using a microcatheter, I then embolized the tract from the biliary side to the bronchial side with coils and n-butyl cyanoacrylate. The bilioptysis resolved immediately. She ate and enjoyed her first meal in 2 years after this procedure. This was an incredibly rewarding case.

What advice would you offer a physician interested in adding embolization techniques to his practice?

Do not try to tackle the most complex of cases early in your experience. One bad outcome could spoil future referrals. Become familiar with as many embolic agents and techniques as possible. Having more of these in your armamentarium will allow you to treat many disease entities. Hone your microcatheter skills. You will become a more adept operator.

If cost were no issue, how would you design the ideal embolization coil or particle? What would its physical properties be, and which materials would be used?

I envision a designer coil that would be safe, effective, completely controllable, and one that makes embolizations more efficient. It would be radiopaque but cause minimal artifact on computed tomographic and magnetic resonance imaging scans. A single coil would be introduced through a catheter into the target. This custom-fit, designer coil would be trimmed to length in vivo and electively detached when the target structure was adequately filled; any residual coil would be removed and discarded. Embolization would not require repeated introductions of multiple coils of different diameters and lengths. This is quite inefficient. The coil would be coated with a material that could be activated, in a controlled fashion, to then permanently fill the embolized space. Oh yeah, and it would be really inexpensive.

Have you had any experience designing or developing medical devices?

I have been working with Howard Root, CEO of Vascular Solutions, Inc. (Minneapolis, MN) to develop several devices for interventionists. We have developed a 30-cm angled microaccess kit for organ entry, such as biliary drainage and percutaneous nephrostomy tube and ureteral stent insertion, and vascular access procedures. It is called the Grebset, which received FDA approval in January 2009. We are also working on a novel marker flush catheter for endovascular procedures called the Trespass. ■