Eric L. G. Verhoeven, MD, PhD

An esteemed vascular surgeon discusses aortic aneurysm treatment technologies and follow-up methods, focusing on the need for individualized patient care.

What are your thoughts on the current progress of fenestrated graft technology? Do you believe this will become the first-line therapy for juxtarenal aneurysms?

The Zenith fenestrated platform (Cook Medical, Bloomington, IN) is now a mature and well-established technique for suitable short-necked, juxtarenal, and even suprarenal aneurysms. Fenestrated stent grafting is less invasive to the patient than open repair; we don't need to confirm this early advantage with comparitive studies. I have heard some say that open repair is better in their hands than fenestrated repair, but I don't personally believe that, based on more than 500 fenestrated cases for complex abdominal aneurysms.

Results show very good short- and long-term outcomes for patients who are treated with fenestrated grafts. Besides using the technology for the correct indication, meticulous sizing, planning, and perfect technical execution are the keys to success. We compared available techniques for complex abdominal aneurysms and found that fenestrated endovascular aneurysm repair really is the right technique for the majority of patients.[1] There will always be patients who should have open repair, and chimney techniques will play a role for a small proportion of patients. It is of utmost importance to select the best treatment option for the patient—and not necessarily for the doctor. There are some anatomic contraindications, so it is important to keep other techniques in mind. The two major anatomical requirements for fenestrated stent grafting are decent target vessels (usually the renal arteries and the superior mesenteric artery) and good caliber access vessels because you need to be able to reposition the fenestrated graft to catheterize the target vessels.

I welcome the work of other companies to enter the fenestrated arena, because it will drive the technique forward. At this moment, in my personal opinion, the other devices on the market are not as sophisticated as the Cook fenestrated graft, but they all present interesting new features that will push the technology forward.

For what procedures are hybrid rooms best suited?

In this field, we are moving forward quickly because the big manufacturers (Siemens Healthcare, Philips Healthcare, GE Healthcare) understand the need for hybrid rooms, as opposed to fixed imaging systems in interventional suites. The concept seems easy: just put a fixed imaging system in an operating room, and you are done. However, the reality is different, because vascular surgeons work together with several people standing on both sides of the patient, and we require open accesses at up to four locations. We also have to consider space for the anesthesiology team and the need for more monitors when performing these procedures, which are more complex and time consuming than standard interventional procedures.

In most major centers, hybrid rooms are already fully functional. At our center, we work with three rooms, two of which are dedicated to endovascular work and fitted with Artis Zeego systems (Siemens Healthcare Global, Erlangen, Germany).

In a few years, every endovascular procedure will be performed in a dedicated hybrid room. At the moment, it is still acceptable to use mobile C-arms for standard procedures up to simple fenestrated cases, but for the more complex fenestrated and branched cases, it has become obsolete. The complexity of endovascular procedures demands the best equipment and setup for the safety of both the patients and professionals involved.[2]

Guidelines in Germany and the UK actually demand a hybrid room setup to perform endovascular repair of abdominal aortic aneurysms (AAA). I would certainly not want to perform cases with a mobile C-arm anymore, as hybrid rooms with fixed imaging systems provide a much higher imaging quality in a sterile environment, resulting in higher technical success, a better outcome for the patient, and much more efficient use of radiation.

You benefit enormously from a hybrid room, especially in complex aneurysm repair cases. If a hospital doesn't invest in a hybrid room for vascular surgeons, it will lose patients, because any surrounding hospital with a hybrid room will market that they have the best equipment. I even expect

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smaller hospitals to get hybrid setups and use them as multifunctional rooms for a lot of specialties.

What do you believe is the best strategy (method and frequency) for long-term surveillance after thoracic endovascular aneurysm repair (TEVAR)?

Really, we need to individualize follow-up care. We should move away from protocols that just say "a CT at 1 and 6 months and then every year." For TEVAR, CT is still absolutely needed unless you use magnetic resonance angiography in suitable stent grafts (nitinol grafts). Nevertheless, I am in favor of an individualized approach, as not all patients require CT angiography (CTA) every year and lifelong. In dissections or traumatic ruptures that have healed, we may want to see a chest x-ray only or a CTA every few years, but not yearly, especially because many of these patients are younger than our AAA patients.

What role should CTA play in aortic endograft follow-up, both in the short- and long-term?

As mentioned with TEVAR, CTA is valuable but certainly overrated with EVAR. I believe in an individual approach here, too. For patients who had favorable anatomy to start with (a long and not-too-wide proximal neck, no marked angulation, normal size iliac artery diameter, etc.), follow-up with duplex and abdominal x-ray is our preferred and first option. Even the first CTA is redundant in those anatomies when the completion angiogram shows perfect exclusion of the AAA. We published on this, and I believe that individually tailored follow-up is the key to success and to lower the number of CTAs needed for our patients.[3]

Do whatever you can to avoid using CTA, but be sensible. CTA should be the last resort investigation, when other techniques fail (eg, obesity of the patient) or demonstrate potential complications (eg, growth of the AAA, endoleak, angulation). Obviously, patients with more difficult anatomies (cases that were just barely suitable for endograft repair) have a higher risk of problems and should be followed more strictly in terms of frequency and use of CTA.

What further data do you believe are necessary to form a more standardized opinion of carotid artery revascularization methods?

As we have seen from the trials, open carotid endarterectomy is still the gold standard in most patients, and improved medical therapy forces us to rethink the indications for surgical treatment. Nevertheless, carotid stenting will continue to evolve and exist, unless authorities decide that it should no longer be reimbursed without better results shown in new trials. I do not believe in "better results in expert centers with carotid stenting," as this would be the same for open surgery. The conclusion is that the majority of patients still benefit more from an open procedure than a stenting procedure. It is increasingly difficult to design trials well and to include patients, especially if trials (like a modern asymptomatic carotid trial) have three arms instead of two.

We perform about 600 open carotid endarterectomies per year and about 30 stenting procedures, which is in concert with what the studies have shown. Researchers are trying to find subgroups in which stenting is better and ways to enhance stenting techniques, but in general, I think open surgery is still the top choice. Stenting also runs into problems with finances and politics, so it becomes more difficult to perform a trial and interpret it, because there will always be people who will say that they can do it better.

Is there a consistent overestimation of contralateral internal carotid artery stenosis? What is the best game plan for imaging before and after carotid endarterectomy?

We adhere strictly to the NASCET criteria, and would do a CTA whenever needed.

In Groningen (Prof. Zeebregts), we demonstrated that a contralateral stenosis is overestimated and should be revisited with duplex ultrasound/CTA before a decision to treat is reached.

How do you decide between endovascular and open repair of popliteal aneurysms?

We have moved away from preferential endovascular treatment for all patients. In the early years, we treated about 90% of popliteal aneurysms with an endovascular approach; now it is about 50% that we deem to be preferentially suitable. I think this is because we pay more attention now to unfavorable anatomy. If the patient is young, active, and has a suitable vein to be used as a conduit, especially in popliteal aneurysms that can be treated from a dorsal approach, then we usually prefer an open procedure (via dorsal approach). Otherwise, if the anatomy is suitable, we consider endovascular repair as a first option. ■

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