Hence J.M. Verhagen, MD, PhD

An expert on endovascular aneurysm repair explains some of his techniques, tools for overcoming challenging anatomy, and the postprocedural risks involved.

What are the possible solutions for overcoming severe proximal aneurysm neck angulation during endovascular aneurysm repair?

There are actually quite a few useful tips and tricks for this. We have to realize, however, that treating severe angulation of the neck is usually still considered to be outside of the Instructions for Use for many devices. Furthermore, severe angulation of the proximal neck may not be particularly difficult to manage during open repair. If one decides to treat severely angulated proximal anatomy with endovascular aneurysm repair (EVAR), there are still rules to obey. For instance, the greater the angulation, the longer the neck length should be. In general, most endografts end up being positioned perpendicular to the patient rather than perpendicular to the aorta. Therefore, the essential sealing length is not achieved, so more length to start with is essential.

In case of heavy angulation proximally, using a flexible and conformable stent graft seems to be advantageous over relatively stiff stent grafts. Using Palmaz stents (Cordis Corporation, Bridgewater, NJ) in severely angulated necks to treat or avoid type IA endoleaks has always been counterintuitive for me because the original anatomy is changed by new forces placed on the vascular tree.

During implantation, it is usually helpful to take out the stiff part of the guidewire proximally to help the flexible graft conform to the anatomy. Furthermore, one has to avoid extreme angulation distally as well for these cases because it makes perfect deployment even more difficult than it already is. One needs a lot of experience with EVAR in general, and especially with the particular device being used, when treating challenging anatomy such as this.

What is your experience with modifying fenestrated and branched endografts to treat aneurysms in challenging anatomy? Do you believe that this is a viable long-term treatment?

I consider fenestrated and branched endografts already "modified," so further modification for challenging anatomy should be avoided. The long-term data on these commercially available endografts are limited at most, and further modification will leave us with a treatment that has a completely unknown durability.

In a study of predictors of procedure-related stroke after endovascular repair of ruptured thoracic aortic aneurysms, your group found that there is a considerable risk of stroke; however, this risk decreased significantly over time. To what do you attribute this change? Do you still view stroke as a considerable risk?

Stroke is, and will always be, a considerable risk during thoracic endovascular aneurysm repair (TEVAR). Its exact cause is multifactorial, with wire/catheter manipulation, hemodynamic instability, local anatomy, age, etc., as clear risk factors. Some of the risk factors may become less important in the future with more experienced teams performing this procedure. Unfortunately, the risk will never vanish.

Are there any factors (aside from arrhythmia) that you might hypothesize as causing late catch-up in mortality rates between endovascular treatment and open repair for abdominal aortic aneurysms?

Oh yes. This will definitively be a multifactorial process as well. Looking at the recently published data from the EVAR trials, we see that post-EVAR rupture is clearly one of the factors causing the survival lines to converge. Hopefully, this may turn out to be very rare in the near future with better endografts and more experience of the interventionist who is treating (or not treating) patients with aneurysms.

Another interesting theory for this late catch-up effect may be that after EVAR, the patients did not have the "near-death experience" of open repair and are therefore less motivated to change their lifestyle and may not be as stringent with their medication as they would be after open repair. As far as I know, this theory has not been proven, and it will be very difficult to prove.

How do you decide who is the optimal patient to undergo endovascular treatment versus open surgical treatment for ruptured abdominal or thoracic aortic aneurysms?

I am a strong believer in EVAR for treating ruptured aneurysms as long as it is anatomically possible. The

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major challenge for hospitals is to take care of the mandatory logistics. In my hospital, every patient who we suspect may have a ruptured aneurysm undergoes a computed tomographic scan immediately, with the scanner present in the emergency department. That way, virtually no time is wasted. The patient goes to the operating theater straight after that, and all preparations by the team are made to begin endovascular treatment (ie, the proper table, the radiology technician is notified, etc.). In the mean time, the operator decides from behind the workstation if EVAR is possible (usually it is) and starts the procedure immediately under local anesthesia. If EVAR is not possible, open repair can be performed with no further time delay because preparations for both procedures were started at the same time.

For abdominal aortic aneurysms, I prefer to implant a bifurcated stent graft, but in certain cases, it is very useful to implant an aortouni-iliac stent graft, as that is usually quicker and sometimes easier. In the majority of cases, the entire procedure can be performed under local anesthesia with a bit of instruction to the patient. When the patient is not able to cooperate as needed, general anesthesia is administered just before the first angiogram is obtained, with the main device ready to deploy on the suspected proper location. I believe very strongly that it is of utmost importance that the anesthesia team realizes that the patient has already lost a considerable amount of blood and that normal clotting parameters should be aimed for. I never use an occlusion balloon because I think it is more important to just deploy the graft as quickly as possible without losing time. An aortouni-iliac stent graft will work very well in unstable patients because control over the bleeding will be achieved very quickly.

In case of thoracic catastrophes, the difference between endovascular and open repair are even larger, so the preference for TEVAR is even stronger. In contrast to EVAR, TEVAR may mean a bridge to open repair more often because the thoracic aorta is usually severely diseased over its total length.

I have to thank all my colleagues in my hospital for sticking so closely to our ruptured aneurysm protocol. If you have encountered the endovascular treatment of ruptured aneurysms within such a protocol, you will never want to go back to open repair—the benefits for patients are huge!

What new EVAR technologies in the pipeline are you excited about? What is on your wish list?

It is good to see that, after a quiet period, new players wish to be involved in the EVAR arena. Especially revolutionary new concepts (like sac filling, for example) have my full attention. My wish list contains two major issues: (1) to finally have endografts for which the follow-up scheme resembles the surveillance program after open repair, and (2) to gain further insight into the genetic background of aneurysm disease to either prevent it from the start or to make sure patients are found and treated in time. ■

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