Claudio Schönholz, MD

An esteemed interventional radiologist shares how his experience developing the first aortic stent graft shaped his career, as well as insights on the future of carotid stenting and mechanical stroke therapy.

When working on the development of the first stent graft with Juan Parodi, MD, did you know at the time what the technology would ultimately become?

When Dr. Parodi envisioned this technique while he was a resident at the Cleveland Clinic, the goal was to create a treatment for abdominal aortic aneurysms that was less invasive, because he noted that these patients usually had multiple comorbidities—issues that made surgery, despite being an excellent technique, difficult to tolerate, so morbidity and mortality were high.

When we started, we were using a tube graft that was only able to treat aneurysms that were limited to the abdominal aorta without extension to the iliac arteries, and they all had to have a very good neck below the renal arteries and above the iliac arteries. Very soon, however, we learned that there were a number of patients who didn't have a distal neck. A year after we started doing the initial endovascular technique, we moved to an aorto-mono-iliac stent graft configuration, trying to treat those who had extension of the disease to the level of the iliac arteries. We even tried something in terms of a bifurcation, but it didn't work. Other colleagues, like Dr. Claude Mialhe, came up with the concept of the modular bifurcated device that we use today.

Regarding your question, I have to say at that point, we did not envision what we have today, which is the result of multiple collaborations from people around the world. Many contributed ideas on how to improve this technology to the point where approximately 80% of patients in the United States are now treated with endovascular techniques, and it is a number that is growing.

If you were to ask me if we thought about fenestrations, branches, or snorkels at that time, I wouldn't have thought so. When we started, we limited this technology to patients who had prohibitive risk for conventional surgery, and we knew that those patients were not going to live for very long. We were concerned about the durability of this technology, and we were right, because if you look back, some of the technologies that came to the market failed because of problems with material fatigue and durability. Of course, now with fourth- or fifth-generation devices, we have learned that we need to make those devices not only efficient at the time of implantation, but also durable over time. We are now using these devices in patients who are younger and will have them for more than 10 years.

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How did that experience affect the immediate next stage of your career?

It affected my career tremendously, because this was when I started working with vascular surgeons, which is something I have maintained ever since. I have worked with Juan Parodi for many years, and I continue to collaborate with him. We have done other projects together, like the flow-reversal technique for carotid artery stenting. Since meeting him and being a part of that project, I've worked with many surgeons, vascular surgeons, and cardiothoracic surgeons, which has had a big impact on the way I practice medicine. I'm a strong believer in a team of physicians working to help patients and bringing out the best in each of us to make that possible, which is the model we have at MUSC.

In general, interventional radiologists didn't do as much clinical work at that time, and working on this project made me move to a more clinical career than I used to have.

Do you think the current generation of thoracic stent grafts meets the demands of treating blunt aortic injury?

I think that the new-generation devices have significantly improved for this particular indication. We now have devices that can be used in younger patients and patients with smaller aortas, which is the case in many trauma presentations. The devices accommodate better to the anatomy of the aortic arch—in particular, to the inner curvature of the aorta. Before, we had some issues with that, and the smaller devices were too big for young patients who had smaller aortas.

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The branched devices that will be used in the near future will include a branch for the subclavian artery, and we will be able to treat almost every trauma patient with this technology.

Do you have any specific advice for those treating vascular injuries in a center not designated for trauma?

When possible, try to fix arterial injuries using less-invasive techniques. Interaction with physicians who do minimally invasive procedures (eg, interventional radiologists, cardiologists, or vascular surgeons trained in endovascular techniques) is very important.

Patients with trauma often have injuries in multiple areas. Imagine a patient who has intracranial injuries and at the same time, has a thoracic aortic injury or another vessel injury—if you can treat him or her with less-invasive techniques, it's going to be better for the patient's outcome. Be as minimally invasive as possible.

Do you think emerging technologies in embolic protection and carotid stents are enough to revive this field?

The answer is yes. I think that at this point, we have excellent technology, both in terms of ways to protect the brain from macro- and microembolization during carotid artery stenting and with new-generation hybrid stents that can take care of the postprocedural plaque protrusion problems we have seen. I believe this technique should be used whenever it's indicated.

Is the downturn in carotid stenting volumes resulting in an educational and training vacuum?

Absolutely, it's a big problem. We had that problem before, not having many people well trained in carotid interventions, and now the fact that we continue to limit the use of the technology makes it even more difficult. I work in a group of physicians, and it's very hard to teach other people with the limited number of cases that we are doing. For CREST 2, which is comparing endovascular with clinical treatment and surgery with clinical treatment, we are having some difficulties finding physicians with enough experience in endovascular treatment due to this limitation on cases.

It's going to be difficult. If we continue to be limited in the number of cases we can do, and therefore people are not being trained, there is a risk that this technique could be buried, but I don't think it will be. Progress cannot be stopped, but it can be manipulated by people who don't want progress to happen, and I think that is what is going on in carotid artery stenting.

Do you see the MR CLEAN trial results as definitive support for mechanical treatment of stroke? How do you believe it will impact the endovascular intervention space in the near term?

Yes, we believe in the mechanical treatment of stroke, and I think that this is following the same steps that happened in the coronary arteries. For coronary artery disease, we used to treat with lytic agents until the PAMI trial showed that treatment of patients with acute coronary occlusions with STEMIs had better outcomes with balloon angioplasty and stent placement rather than lytic therapy. The same is happening in stroke, and now we have the results from MR CLEAN to validate that. I think the same is also going to occur in the peripheral arena, where mechanical thrombectomy and thromboaspiration will be used first, and thrombolytic therapy will be used as a secondary treatment, if necessary. Of course, we still don't have those data, but that's what I believe will happen. If we can get rid of the clot and reestablish flow using mechanical maneuvers or techniques, I think that's the way to go in every single field.

The Penumbra aspirating device and the stent retrievers are working very well. It takes minutes—just a few minutes—to remove the clot and reestablish flow. If there is any residual clot, then you can do thrombolytic therapy, but I have no doubt that the results are going to be better with mechanical treatment. I think that this study will continue to support those who are already doing the procedures.

For peripheral interventions, how do you decide between a newer technology that has less long-term data and an older technology that you've been using for a long time?

I continue to believe in innovation, and I strongly believe that there is always the possibility to do better and to find ways to treat patients more efficiently, less invasively, and with a better result. I have a tendency to be open to trying new technology, but of course, it needs to make sense to me. At a certain point in your life, you have an amount of experience that you think you can predict what is going to work and what is not. But even with that experience, sometimes, there are things that you don't think will work, and then you are proved wrong. So, I try to give the opportunity to new technology, unless I don't feel that it's safe for my patient—safety first, but if I think it's safe, I'm open to trying a new technology. ■

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