Stents: Wolfgang Radtke, MD

Intro

My name is Wolfgang Radtke. I'm the Director of the Cardiac Cath Lab here at Nemours. Interventional cardiologist primarily. But also diagnostic cardiology, invasive diagnostic cardiology.

Why are stents used?

They're used to open up obstructions and blood vessels mostly. And usually the time to use them is when a balloon angioplasty- just inflating a balloon across the obstruction- is not keeping it open, that it collapses back down. Also to achieve a little bit more of a lasting result. Because with balloons alone, there's always recoil. And the stent overcomes it because a stent is a metal mesh or metal lattice that's mounted on the balloon, expands with a balloon. And when the balloon's deflated, the stent holds open the obstruction. There are also stents that are self-expandable, so they are not placed with a balloon. They open up by themselves once they're released out of a sheath. And the disadvantage of those is that they don't- they can't re-balloon them, they can't make them bigger and we're dealing with kids, so we have to deal with growth. And stents don't grow. So they have to be re-dilated. But it's basically to open up obstructions.

Why would you choose self-expanding stents vs. balloons?

Well, if you have an 18-year-old or a 20-year-old, then you could use self-expanding. Certain situations, where the obstruction is inside a surgical implant or inside a structure that will be replaced further down surgically, then I can also do it because it's going to come out anyway. But that's pretty much it.

How do you define the success of a stent and its deployment?

Well as the success of the procedure is to achieve the size of the target vessel that's equal to the healthy vessel next to it. Then yeah, that's really all there is to it. Now there's certain things that can go wrong. The stent has to also be in the right place. It usually extends beyond the length of the obstruction. And it could happen that during deployment it slips a little one way or the other. So success is also to place it exactly in the right spot. And the ideal stent would just limit the stent coverage to the area of obstruction.

What is your biggest concern when placing a stent?

To get it right. I mean, that's the biggest concern. To expand it to the diameter. Sometimes a stenosis or the obstruction can be so tough that even with very high-pressure balloons, you cannot expand the area enough. But that's a problem- that's the territory. Nothing you can do about it. That's, I mean, the angiogram shows it, so I know it right away.

How do you know when a stent is inserted properly?

There's only one try, first of all. You either get it right or you don't. You can't correct it. This is an angiographic procedure, invasive procedure. So the first part is the angiogram of the obstruction to measure it, to see how long it is, how tight it is, to measure the vessel next to it- how large it is. And then the angiogram is repeated after stent deployment. So again, to image the vessel in the area of obstruction, compare to the area of the healthy vessel. So the angiogram shows success.

So a catheter is put in the vessel that where the obstruction is or somewhere next to it when we're still searching for the obstruction. But usually one has an idea where it is, based on ultrasound echocardiography, or theoretically CT scan- but in pediatrics we don't do that so often. Catheter is put in. An angiography catheter picture was taken. So I'm already in there. And then that's exchanged for the

stent, either balloon mounted or self-expanding stent. And the diagnostic catheter is put back into position. So take another picture. So it's all one part. Those are all parts of one procedure.

Are any components of the deployment system reusable?

Can't do recycling. Well, yeah, it's not being done. It could be done, but.

Can a stent be moved after it is placed?

Basically no. The point is you expand it with a balloon, it's against the wall. You can't really- or it's a major effort to try to re-cramp it down. And sometimes, and most of the time, impossible to cramp it down to a size that it can be removed through the blood vessel. It's usually an all or nothing procedure.

What are some challenges with stents?

Challenge number one is that if you have a baby where you have to treat it, can't treat it with a balloon, you need a stent-- There is really no stent that allows to re-balloon, re-dilate over time to an adult size. So that's one of the challenges many people are working on- to create a stent that can be re-dilated to three or four times its diameter, or five times its diameter. That's a design problem. Then the other way of trying to deal with it-- This has always been this concept of resorbable stents. They disappear. That has, there are some question marks to it. One, what will happen- will the vessel just collapse down, which can happen? But typically resorbable stents have a lot of inflammatory response. So that leads to narrowing of the vessel and beats the purpose.

Theoretically the concept of putting a stent in that can be removed would also be a nice one. Doesn't exist.

So that's one. The uniformity during deployment when it's on a balloon. So there's only one diameter that you can have the stent be- the balloon of the diameter. But sometimes that's not the best solution. You want to have a larger diameter on one side and a smaller diameter on the other side. That doesn't exist.

How do you determine which brand of stent to use?

Well, it all depends on the size. We use- obviously rarely use coronary size stents. In coronary stents there is a huge selection, but now most of them are drug-eluting, which is not necessarily what we want. We generally use larger diameter stents. They are typically developed and approved for peripheral vascular work in adults. So that limits the selection of brands, but it's- We usually have different brands, but also it depends on vendor preference by the institution and all of those things. And since the number of procedures in pediatric institutions is not so high, we have to buy the equipment-- and the adult cath labs, typically, they are on consignment. So the companies put all their stuff there, and you pay when you use it. In pediatrics, the numbers are so low that the companies don't do that. So we have to invest, which means you can't have everything. Not all kinds of different brands. But we select them based on user friendliness.

What makes a system user-friendly?

Flexibility to negotiate to the place you have to go to. Degree of recoil, sturdiness, the ability to re-dilate, and all those things. So several elements play a role.

What is the process of adopting a new device?

Usually when I- when we see that there's a new device, let's say some other people have made, good experience and discovered it. Then we gradually swap out. So one gets used, gets replaced with the other. If a device would be strikingly better, we would probably say, okay, forget the other ones. But usually this small iterations and minimal differences. And actually a current problem is more that companies

discontinue items because they're not used as often. And usually it's in the range of the things we use because it's just pediatrics-- That's pediatric cardiology or pediatric radiology. It's just not a big market. And you find out by publications, by hearsay, people presenting at the meetings. We don't have reps knocking on the door all the time. The adult cardiology tends to have that, but that's usually not useful.

That's how it used to be- that the reps are knocking on all kinds of doors and bringing it and say, usually they say, okay, here's a sample, try it out and you get it for free. And if you like it, then we'll go with it. It's not bad. Usually you would only accept it from companies that you know and trust. But, for example, I've been in this business for a long time since the 80s, so I've been around, so I know how to judge- is this just a gimmick or is it something real?

How do you determine if a new product is a gimmick or legit?

By technical understanding. For this particular job, you have to have some good sense of mechanics and physics. And I can look at something and figure out if it's going to work or not. Or somebody shows me. And then I judge, does this have a chance from being- from using comparable or other devices during the work, I know how this- how potentially suitable a new device could be.

Who has input into adopting a new product?

The users should be the only ones who decide. But, let's say this is from a new vendor, then it has to go through the New Products Committee of people who supposed to vet it. They're not usually in a position to really know if it- why it's better or why it's worse. But they have to approve it. So that's a process, takes a few weeks.

What is the disadvantage of a standalone pediatric hospital?

I used to be in a hospital where we- pediatric was just a few floors and the cath lab where I do the procedures was above or below the adult cardiology division. So if you- all kinds of extra toys that they have- it was easy. I just get them. There are items that we would rarely use so nobody can afford it. They use it all the time so you can borrow it. That is definitely a disadvantage to be a standalone children's hospital unless you're so big that you can have all that and so well-endowed that you can have all that. But there's only three or four hospitals in the country that have that ability.

What are some challenges when learning as a novice?

Lots of challenges. With regard to the stents- I think it has more to do with what you come with, what background you come with. If you are able to fix things in your house, you probably are able to judge a stent. If you can't fix anything, even if you try really hard, then you're in the wrong place. That's how I view it.