Heart disease is the leading cause of death in America. The most common form of heart disease is coronary artery disease, in which the arteries that carry blood to the heart become clogged. Surgeons at Robert Wood Johnson University Hospital are now performing minimally invasive heart surgery to treat this disease. The procedure, known as off pump coronary artery bypass, is performed on a growing number of patients with coronary artery disease. During the off pump procedure, special surgical instruments stabilize the heart and hold still the small portion of the heart where the surgeon will sew a bypass graft. The rest of the heart continues to beat and circulate blood through the body. You are about to see an off pump coronary artery bypass in a live webcast from Robert Wood Johnson in New Brunswick, NJ. During today’s presentation, you may send questions to the faculty at any time by clicking the email button on the player.

PETER SCHOLZ, M.D.

Welcome to Robert Wood Johnson University Hospital’s live webcast from New Brunswick. We’re going to show you today an off pump coronary artery bypass procedure. Dr. Krause, where are you right now?

TYRONE KRAUSE, M.D.

We’re about halfway through. We harvested the saphenous veins and we harvested the internal mammary artery and we’re basically ready to do the main part of the surgery, which is the distal bypasses to the arteries on the heart. I have my crew with me, my scrub nurse, Cheryl Homan, and the RNFA’s, both Mary O’Brien and Rhea Alvarez to my left. Dr. Platte, just in front of me, is my assistant. Dr. Selina, who has been doing most of the off pump bypass anesthesia, to my right.

We’re just going to get ready now. We actually looked at the coronaries. I don’t know how well it will come out, but on the surface of the heart here is the LAD and we’re going to do that last, actually. We’re going to lift the heart and do the right coronary bypass first, which is around the back. To do that, we have to use these stabilizing devices and this allows us to do the off pump surgery. We’re going to put this on the surface of the heart and it’s going to stabilize it in a certain area and that will allow us to get to the back of the heart, where we have to do that first bypass.
This is just a suction device that actually sticks to the heart and allows us to maneuver it where we like. We also put the whole bed in Trendelenberg position, which is head down position, which helps the blood pressure and maintains hemodynamic stability. One of the main problems with doing off pump surgery is that it’s difficult to replace the heart-lung machine, which keeps the patient stable during surgery, so we have to do a lot of other maneuvers. We have to give a lot of medications during the actual procedure to maintain the blood pressure and maintain the organs, so it can be a little confusing during the surgery.

Now we’ve just placed the second stabilizing device. The artery that we’re going to target is right here. It’s on the back of the heart. It’s called the posterior descending artery.

PETER SCHOLZ, M.D.

Just a brief introduction. This is a 71-year-old patient who has had known coronary artery disease and approximately two weeks ago underwent angioplasty and stent placement. Unfortunately, after about a week, he developed recurrent symptoms and underwent cardiac catheterization again and was found to have significant three-vessel disease that we felt was best treated with bypass surgery.

TYRONE KRAUSE, M.D.

That’s correct. The stent actually didn’t last more than a couple of days. That was around the back of the heart on the other side. It’s called the circumflex artery, which we will address later. They planned on trying to do 3-4 stents, places in all his arteries, but that first one didn’t take, so therefore they opted to not try to redo that or place another stent there.

One of the issues with the off pump surgery, you have to keep a bloodless field and you also have to maintain a stable field. One of the things we do is put a loop around the artery to cut off the blood supply temporarily, for a couple of minutes. Another thing we do is place a stent inside the artery to maintain a bloodless field also.

So now we just opened up the artery and we’re ready to suture it.

PETER SCHOLZ, M.D.

I would just like to remind the audience that you’ll see on your screen a button that you can push if you would like to email us a question that we’d be happy to try to answer if we can clarify anything that you have a question about. Dr. Krause mentioned that at times you can use a stent. I don’t know if this will project, but I’m showing you here this little device that is a little bridge with a string attached to it. This goes into the artery and allows blood to be conducted past the anastomosis so the heart remains perfused while you’re working on hooking up the new artery.

TYRONE KRAUSE, M.D.
Now we’re starting to suture the coronary to the opening that we made in the posterior descending coronary. We use 7-0 Prolene to do the stitching. Another interesting device is this mister. It blows some of the blood out of the field, so that enables us to stitch under direct vision.

PETER SCHOLZ, M.D.

That is very helpful and very important, to maintain a bloodless field. It takes a very dedicated and observant assistant or technician to really direct the flow in the right area to make it bloodless. I don’t know if you can see on the monitor, this is what the device looks like. It can be bent in any way to accommodate proper positioning and direction. The saline that is used to wash out the blood is being misted with CO2 at a rate not to inject air into the heart.

TYRONE KRAUSE, M.D.

We’re about halfway through this and so far we’re remaining stable. The blood pressure has been good. It’s amazing what you can do to the heart during one of these operations to maintain stability. We’re just lowering it down.

PETER SCHOLZ, M.D.

As you can see, while the area that they’re working on is remaining motionless and with the mister will be kept clean, the rest of the heart is able to beat unimpeded and that allows us to maintain the circulation and the blood pressure.

We have a patient just emailing in saying that he had what he called keyhole surgery personally at another hospital in Pennsylvania and was home in three days. I think this points out that it has been clearly shown that off pump surgery will allow us to shorten the length of stay of patients, on the average.

TYRONE KRAUSE, M.D.

Yeah, the keyhole surgery is probably for more of a single bypass operation. We’ve done a number of operations with the smaller incision where you do the one bypass. To do the back of the heart, it’s difficult to do a keyhole and certainly difficult to do more than one bypass with the keyhole incision, but I agree that getting patients out of the hospital is a priority. It appears so far that the off pump surgery does give some benefit in terms of decreased stroke and decreased blood transfusion rate. Some studies show that it has improved the decrease in length of stay.

PETER SCHOLZ, M.D.

While you’re seeing Dr. Krause finish this first hookup, I just wanted to briefly talk about, for the public listening to us, what are some of the warning signs if you have
blockage in your heart arteries and what do you need to heed and pay attention to? First and foremost, the main symptom is what we call chest pain and it’s often confusing because patients will tell you, well, we don’t have pain, it’s not a pain, but a dull ache or pressure behind the breast bone, but pressure or chest pain is one of them. This may be intermittent and it may radiate to different areas, the neck, the shoulder, the back, and it can be sometimes confused with indigestion, so it is important to follow this up with your doctor.

TYRONE KRAUSE, M.D.

One of the interesting things about the off pump surgery is the decrease in complication rate in patients who are high risk in terms of bad pulmonary function, bad kidney function. Especially in those patients, it is certainly a benefit to try to do the least traumatic. So far, off pump is certainly the least traumatic. You don’t get the major side effects to the cardiopulmonary bypass.

PETER SCHOLZ, M.D.

One person called in and asked did we open up the sternum to do this operation? Like you mentioned, except for the mid cap, where you open the chest through a small opening on the side, most off pump surgery is performed by opening up the sternum to get access to all sides of the heart. That’s been our standard approach.

TYRONE KRAUSE, M.D.

Right. There have been a couple of attempts over the last few years to try to do more keyhole incisions on multiple bypass and so far the data is not convincing that it’s of benefit, so we have to go back to the drawing board and try to improve the technology to see how that’s going to pan out.

PETER SCHOLZ, M.D.

One person called in and wanted to know what happened to the stent that was put in a couple of weeks ago. Did it close off or...?

TYRONE KRAUSE, M.D.

Yes, it closed off. It’s still in the body, still in the artery. You can actually feel it on the surface of the heart, but the patient paid for it, so he can keep it, although it’s not doing him any good right now.

PETER SCHOLZ, M.D.

As you mentioned, he wanted to know a little more about the disease. He had actually significant three vessel disease.
TYRONE KRAUSE, M.D.

That’s the interesting thing. Nowadays, with all three arteries, they are putting stents in all three arteries and trying to minimize surgery. In the past, if you had all three main arteries blocked, that person automatically went to the operating room, but nowadays, with the advent of the better stents and so on, they were planning on doing two more stents in the two other main arteries, the two that we’re going to do. Being that that one occluded or blocked, they felt that to repeat this probably wouldn’t have been of any benefit, so in essence they were going to plan to do all three of his major arteries with stents.

We just finished this bypass. I’m injecting some fluid down, checking it for patency. Everything looks fine with this. It’s got an excellent flow, so now we’re going to put the heart down, give it a break for a second or two.

PETER SCHOLZ, M.D.

I think that’s a very important thing. The key to success with this operation is a very close knit and closely working together team. When the heart becomes unstable, the surgeon has to be patient enough to wait a little while for the anesthesiologist to stabilize the heart, so it’s really key to work hand in and hand to make this as successful as we have.

TYRONE KRAUSE, M.D.

That’s true, what you said. The most important thing is the communication between not just the scrub nurse and the circulator and the RNFAs, but the most important is the anesthesiologist. As I mentioned, Dr. Selina has done a lot of these now and basically he could do the case himself. I basically just stand here.

So now we’re going to do what’s called the ramus artery or high diagonal artery on the left lateral surface of the heart, so we’re just positioning the heart again. Then we’re going to use this same stabilizing device to do this. As you see, it’s shaped like a forklift which goes on either side of the artery. It has a suction device on it which sticks to the surface of the heart and then we just stabilize it in that position.

PETER SCHOLZ, M.D.

One other viewer had written in and noticed some irregular heartbeats. He was wondering if that was due to a pre-existing condition or if this was a big problem. With off pump surgery, and I think he was very keen pointing out that actually we have to pay a lot of attention to arrhythmias and treat dysrhythmias prophylactically to make this safer.

TYRONE KRAUSE, M.D.

Yes, that was a good observation. Quite often we will have arrhythmias because patients that we operate on have occluded coronaries. By maneuvering them one way or the other,
it certainly is not to their benefit before you do the bypass, so again, the anesthesiologist usually treats those aggressively and certainly it can come to a point where we may have to go back onto the heart-lung machine. There are times that, if the arrhythmias are either too severe or affects the hemodynamics of the patient, then we will. Now, since we started doing them here last year, there’s a 4-5% crossover rate to the heart-lung machine, which is about the national average. The average around the country now is about 20% of institutions are doing off pump.

PETER SCHOLZ, M.D.

This is a beautiful demonstration of how you can stabilize the heart and you have really a very motionless field where you’re working, whereas the rest of the heart is still contracting normally and maintaining the blood pressure. I think these devices, like you mentioned, the one you’re using now to stabilize it, the octopus, was invented by a Dutchman and is a very nice way of stabilizing the heart without disturbing the hemodynamics. If you look on the other side, you can see the suction cups. That’s why it’s called an octopus and that’s how the suction is applied to the heart. It’s attached to the heart.

TYRONE KRAUSE, M.D.

It’s been a few years now. This is a fourth generation device. Initially I guess about three years ago, at least in my opinion, they weren’t as good as now. I had tried doing a couple and it just didn’t stabilize it well enough.

PETER SCHOLZ, M.D.

I have a question here from a viewer that I think I get every day in the office. That is asking, what do you do with the ribs when you get to the heart. I think a lot of people think that we cut the ribs or break the ribs. Actually, with the sternotomy, we go through the middle of the breast plate and we actually do not dislocate or break the ribs or go between them for the most part.

I know you’ve done now over 300 consecutive unselected patients in a row. What has been the average length of stay, one of the viewers asks?

TYRONE KRAUSE, M.D.

So far, it seems that we’ve been around the same length of stay for a routine bypass with a good ventricle. In other words, no other real major problems with the patient. It’s probably around five days. We’ve had patients get out of the hospital in 3-4 days, but the information just asked that way is kind of skewed a little bit because we have a lot of older and sick patients which require a lot of extra help and either go to rehab centers after the surgery or just have nobody to take care of them, but the lower risk patient certainly gets out of the hospital quick. I’d like to emphasize the main reason why I like it is I haven’t had one stroke in over 300 cases and these are all comers, like I said, with
severe coronary disease, severe aortic problems, calcifications, and so on like that, which all contribute to the risk of a stroke, severe carotid artery disease, so I think those are the real devastating problems that occur after any open heart surgery. I think the data will bear that out.

PETER SCHOLZ, M.D.

One person wants to know if there’s dollar savings. Danielle wants to know if this is cost-effective compared to on pump surgery.

TYRONE KRAUSE, M.D.

I don’t have the exact numbers so far, but we have saved in blood products. We took a random sample of patients that we did on a heart-lung machine and the transfusion rate was about three times higher than the off pump surgery, so there’s a cost benefit there, not just in money, but also the morbidity related to receiving blood products. We also don’t use specific types of drugs to minimize bleeding after the off pump and that has saved the hospital probably in the range of a half million dollars for this coming year. The length of stay issue, we don’t really have it in dollar signs just yet. As far as the material used and how we do the surgery, the manpower in the operating room, the heart-lung machine and all that, the company tells me that they’re going to be giving the hospital a rebate for a significant amount of money, so they’re going to be saving on that. So there are lots of ways that there are benefits from a financial point of view.

We’re just finishing up now this second bypass. A couple more stitches. Again, I’d like to emphasize that communication in the operating room is the most important thing. I hardly ever spoke to the anesthesiologists before I started doing these, but now they’ve become my best friend. Certainly the girls at the foot at the table that help with the harvesting and the scrub nurse are also important.

PETER SCHOLZ, M.D.

We can’t over-emphasize that. It’s the whole care team that has to be involved, starting from the preoperative evaluation, the preparation of the patient, the types of drugs to avoid or not use, and that’s the key to the success of this or any operation.

TYRONE KRAUSE, M.D.

And it just doesn’t stop in the operating room. Certainly a major part of the cost savings for the hospital and decreasing the length of stay is really with the postoperative care, the nursing personnel, the physical therapy around the clock, all the ancillary care, pulmonary care, respiratory, physiology, right down to social workers and discharge planners. It’s a whole group approach to minimize the hospital stay. To me, I think that’s going to be the main area of hospitals in this day and age, to save money and minimize losses.
So now we’re just tying in the second bypass. Again, the patient has remained stable throughout. No more arrhythmias. We had some arrhythmias when we had the heart up before. Now we didn’t torque it as much, so there’s probably less strain on the heart.

PETER SCHOLZ, M.D.

Now, heart surgery when it was started doing coronary bypass grafting as a regular operation, was done on the arrested heart using the heart-lung machine. This has now been performed for over 30 years. You have a very controlled situation, a bloodless field and a non-beating heart, using the heart-lung machine that allows you to re-route the blood away from the heart and the lungs, but the downsides are that it causes a systemic inflammatory response in the body and neurological complications like you alluded to. There have been a number of studies that suggest the psychomotor and neurodeficits that you see with the heart-lung machine are less when you don’t use the heart-lung machine but do off pump surgery. That may be one of the other advantages.

Of the over 350,000 bypass operations that are done yearly in this country, about 30% are now done off pump nationwide. That varies, I guess, from group to group and practice to practice, like we do 100%, almost, off pump and others in our group do more using the heart-lung machine and I think that varies across practices also, but overall about 30% are now being done off pump. Do you think that’s going to increase over time?

TYRONE KRAUSE, M.D.

I thought so initially. It should, I think, as time goes on. It’s interesting that it plateaued at that number within the past year. I’m not sure why it just stopped there, but that should continue to improve. I think it may depend on technological advances of the materials, maybe more and more it will catch on, like I said, as the technology improves.

I just want to describe now, this is the internal mammary artery that I’m preparing. I’m just opening it up here to fashion the edge and we’re going to suture this to the main artery on the front of the heart, which is the LAD, which is going to be right over here. As you know, this is a pedicle we take from the undersurface of the breast bone.

PETER SCHOLZ, M.D.

This viewer audience really spans the whole spectrum. Here’s a young man watching with his mother. He’s eight years old and he wanted to know how you repair the breast bone after you cut it.

TYRONE KRAUSE, M.D.

Basically what we do is we just put it together. We oppose the two edges together and take heavy wire and just wire it closed. Like any other broken bone, that creates a cast for the bone to fasten itself. It takes a couple of months, but basically we oppose both edges
with wire. It’s a good question because occasionally, maybe 1 out of 1,000 will have a problem with the breast bone. Either it’s too soft or it cracked or sometimes if patients are built differently, we’ll have to reconstruct that. I’ve had maybe a dozen cases over the last 10 years where I had to have an orthopedic person help me close it with a metal plate, so it’s not as easy as it sounds, just closing the bone with wire, and certainly we’ve had our problems with that over time, but again it’s less, maybe 1 out of 1,000.

PETER SCHOLZ, M.D.

One of the viewers wants to know the side effects of having an off pump heart operation. Are there any down sides? We talked about some of the advantages, shorter length of stay, getting back to work faster, having less damage and trauma to the heart muscle. Are there some down sides?

TYRONE KRAUSE, M.D.

I think the main down side is knowing, in the operating room, if the person is not stable enough for it, you have to know enough to get on the heart-lung machine before any damage gets done because, as you saw when I did that artery around the back of the heart, with the heart lifted up for that short period of time, if the heart is lacking blood, you can be having a heart attack during the procedure. Certainly you can have a heart attack during any open heart surgery, but you have to be aware of the signs early on so that you know to put the heart back in its normal position, try to increase the blood pressure. So basically the risk of a heart attack or the risk of having some heart damage can occur, but that’s the main risk. As far as all of the risks associated with the machine, those are done away with, obviously, because you’re not on the heart-lung machine, but the main thing is knowing when to stop or knowing when to put the heart down.

This is my suction device. As you see, again it’s like a forklift that’s on either side of the artery. Sometimes it squeaks. I don’t have a good physiological answer for that.

PETER SCHOLZ, M.D.

As you can see now, they’re lowering the mammary artery down to the opening in the heart artery and we use a monofilament smooth, slick suture that allows us to do that so you can precisely put each stitch in the bypass graft and then the artery before you slide it down, so a lot of things go into making this a safe procedure.

We’ve talked about this a little bit, but one of the viewers want to know what the relative blood loss was in an off pump patient versus being on the heart-lung machine. On the heart-lung machine, you don’t necessarily lose that much blood, but you’re diluting the blood volume and lowering the blood count and that is part of the problem. The amount of blood loss during off pump surgery is less and that’s why you have less requirements for blood transfusion.

TYRONE KRAUSE, M.D.
We have a cell saving device which recirculates the blood eventually, if we lose it, but initially we weren’t really even trying to save blood and we had dropped the blood transfusion rate to about 1/3 compared to the heart-lung machine and those were all comers also. I think as time goes on, it’s probably going to be less than 10% of people operated on will receive blood. If we showed an on pump case, you’ll see that there are a lot of cannulas you put in. The dilutional effect, just by going on the heart-lung machine, plays a major role in blood loss. The machine itself creates less of a coaguable state, so the patient will bleed easier and they receive more Heparin, which is the blood thinner that we ordinarily use, so there’s a whole cascade of things which increases the blood transfusion rate with the pump.

PETER SCHOLZ, M.D.

We have some great questions coming in that we see often in the office, so it’s kind of nice to be able to address the large public and let them know the answers to some of these questions. They wanted to know if this heart that you’re operating on is enlarged.

TYRONE KRAUSE, M.D.

Yes, it is a little enlarged, what we call hypertrophied, the muscle. You really can’t tell from the outside. It actually looks pretty normal from the outside, but we have a TE echo, transesophageal echo. It goes in the food pipe and we can actually get a good picture of the heart from the inside. Dr. Selina does those routinely. Call of the cardiac anesthesiologists here do that routinely on everybody. He has a thickened muscle to his left ventricle, which is the main chamber of his heart.

PETER SCHOLZ, M.D.

The yellow discoloration you see is actually fat on the heart. That’s what somebody asked also.

They also wanted to know what we do with the arteries if they’re totally closed. We actually don’t remove them or cut them out. We just leave them in place. That’s a question we often get.

TYRONE KRAUSE, M.D.

It’s like before, what do you do with the stent? The stent stays in and we just go beyond where the stent blocked. There’s a reason for that, obviously. If you see a stent, there are numerous metal prongs that stick into the wall and certainly just to take that out, you’d run into all sorts of bleeding problems and it just isn’t necessary.

So now we’re just putting our last stitches in of our last bypass, the third one here. Then we’re going to get on to doing our two proximal anastomoses or connections to the aorta.
PETER SCHOLZ, M.D.

I have on the screens here the statistics at Robert Wood, off pump versus on pump bypasses. We’ve always done a small number, smatterings here and there over the last several years, but it’s last year, when you started doing this as a systematic approach, that the numbers increased significantly. In 2003, we did a little over 200 off pump cases. That, by the same token, has brought down the number of on pump cases to a certain degree, but overall our volume has stayed pretty much the same, with only a very little decrease.

TYRONE KRAUSE, M.D.

I think in this day and age you have to try to make it a little easier on the patients. If you can do it just as safe and do as good a job, the key thing about the off pump, you want to be able to do as many bypasses as you normally would be able to do, but if you can do it safer, then I really think you’re doing a benefit to the patient.

So now we’re just tying down this last one. This is the internal mammary artery to the left anterior descending artery. It’s got a nice pulse in it. As you see, we really didn’t have to struggle. One of the main reasons for going on the heart-lung machine is that you just couldn’t operate with this fine material with magnifying glasses, the loupes that we wear, on something that’s moving. These coronaries, they don’t project well on the screen, but they’re about 2 mm in width, so we have to really have a stable area in order to do that.

PETER SCHOLZ, M.D.

Is it important in what sequence you bypass the blocked arteries? I noticed you started on the right side and ended up, at the end, with the artery on the front. Are there times when it’s important how you sequence this?

TYRONE KRAUSE, M.D.

I think, in general, the one that’s the most ischemic or the one that’s causing the patient the problem I like to try to bypass first, but one of the issues that comes up with the internal mammary artery, it’s a pedicle that’s attached up in the chest and if you put that on first and then you do all your manipulating and maneuvering of the heart afterwards, there’s a chance of tearing that, so if I can get the patient stable enough to do the other arteries first, I would try to do the mammary last. Now, certainly the left anterior and the mammary are the most important arteries to do, so I kind of look at the heart and try to make a judgment call on each case. I’ve had patients that became a little unstable when I didn’t do the mammary artery first, as it was blocked very severely and the patient was very dependent on it. By lifting the heart and doing the one in the back, I’ve had problems with stability and then I had to go back and do the internal mammary first and take my chances with possible tethering or tearing, so it’s a good question. I think I try to do the ones around the back of the heart first in order to minimize the chance of causing a problem to the internal mammary artery.
So now I’m just fashioning the coronaries that we just did. We’re going to be putting these connections on the aorta. These are the proximal anastomoses. We’ll be stitching these to the aorta.

PETER SCHOLZ, M.D.

Just for the viewers’ sake, Dr. Krause is taking particular care to make sure the grafts are not twisted when he attaches them to the aorta and also that he uses the proper lengths so they’re not too short or too long or kinked. That’s very important.

TYRONE KRAUSE, M.D.

It looks like we’re doing this and it’s relatively straightforward, but there are a lot of little things that can occur to the grafts so that they don’t have as much survival, longevity as you would like. Any little thing could cause a problem with them. That’s why you really have to take care, as Dr. Scholz mentioned, not to twist them, not to damage them when you get them out of the leg, how you treat them, and so on.

PETER SCHOLZ, M.D.

What they just did is put a partial side-biting clamp on the main blood vessel, the aorta, and that allows them to open up, make a small opening in the aorta so they can then suture the new conduits to the aorta. This is now a good view to see and explain why it’s called a bypass. It is literally a detour or bypass where you reroute the blood from the main blood vessel, the aorta, where you’re hooking up the vein now and you’re going around the blockage in the artery and hooking it up to the heart artery downstream from the blockage. That’s why it’s called a bypass.

TYRONE KRAUSE, M.D.

So now that we did the proximals, we’d like to try to get the pressure down a little bit because we’ll be manipulating the aorta a little.

PETER SCHOLZ, M.D.

So again, communication and teamwork and working very closely with the anesthesiologist, who pays close attention, is key to the success of this.

Justin wanted to know if we ever use artificial grafts for coronary bypass. The answer is no, that has not been effective, although there are a number of centers working hard on trying to create small vessel conduits, either from the patient’s own tissue that is homegrown or modifying animal tissue to make it suitable. There is nothing available at this point commercially.

TYRONE KRAUSE, M.D.
There are so many different ways of looking at bypassing, getting blood to the muscle. As you know, initially when bypassing got started, they didn’t actually suture the bypass to the artery itself. They actually sutured it into the muscle, hoping that over time that would grow smaller arteries. It’s similar to the concept that we do here. When we have a patient that we can’t do a bypass for and all of the arteries are totally blocked and there’s really no other thing you can do for them and they’re having chest pain and symptoms of blocked arteries, we can use the laser machine, which we’ve done here on many occasions, to make extra channels in the heart to give them some benefit.

PETER SCHOLZ, M.D.

Reba writes and wants to know if off pump surgery is more difficult than on pump bypass surgery. I guess she hit the nail on the head. There’s clearly a significant learning curve and it is a lot more challenging for the surgeon to do an off pump operation, so it does take extra skill and learning time.

TYRONE KRAUSE, M.D.

That’s probably one of the main reasons, probably the main reason why, like you said before, that more people don’t do it. It’s kind of plateaued around the country, the total number, percentage-wise, 20-30%, something like that, and that may be one of the main reasons, the technical ability. I’m not saying I’m a technical genius or anything, but it just takes a little more patience and cooperation from all your team. Everyone has to be working like a nice symphony.

PETER SCHOLZ, M.D.

Danielle is really watching carefully. She’s sending in another question. She says she really doesn’t know the right terminology, but she’s addressing when do you have to convert the procedure to on pump and is that something that can be done or does the patient die if something happens and it doesn’t work off pump?

TYRONE KRAUSE, M.D.

No, basically you want to do the best job you can do. What I do when I’m doing the bypass, if I feel I could have done a better job on a heart-lung machine, then I’ll consider going on the bypass if I feel it’s going to make a difference. Certainly if you can’t do the bypass, can’t lift the heart up, and all the medicine you give does not maintain the blood pressure, then you’re really forced to go on the heart-lung machine, but you have to be aware of everything. I’ve had patients struggle a little bit because I wasn’t aware quite as often about the blood pressure, so you have to be cognizant of everything.

PETER SCHOLZ, M.D.
This question reminds me that I remember, most of the time when you do an off pump bypass, you use an all arterial system and she wanted to know if we do that often and why not here, in this case?

TYRONE KRAUSE, M.D.

We’ve done a number here, if not all arterial, sometimes we’ll use both mammary arteries. The mammary area on the left, as you know, is pretty standard for the left side. On the right side, it does increase the risk of infection or sternal problems by using both mammarys. In this patient, the mammary artery probably wouldn’t have reached all the way around. I like to use them when you’re going into the more proximal portion of the right coronary. Certainly with the radial arteries we do also use, particularly, I think, younger patients will seriously consider using the radial artery or both mammarys. So now we’ve finished this one proximal. We have one more to do and then we’ll be closing the chest.

PETER SCHOLZ, M.D.

Will makes a good point with his question of what do you do with your blood lipids and lifestyle. Is there anything you do after surgery? I think it’s very important that this is basically a plumbing job to alleviate blocked arteries, but in order for the new bypass tubes to remain open, you have to change your lifestyle, modify your cholesterol and eating habits. Those are key things if you want to preserve and maintain these bypasses in an open condition.

TYRONE KRAUSE, M.D.

That’s key. We’re only, like you said, plumbers and basically it’s palliation. Certainly if this patient or any patient continues to smoke cigarettes or doesn’t control their diabetes or keeps on going to McDonald’s or any source of diet that’s consistent like that, it’s going to come back in other areas, but I think the postoperative care is the most important thing in the follow-up. Physical therapy, change in lifestyle, watch your weight. Most of these patients, they learn their lesson after their chest is opened, to really pay attention to those things a lot more than before. Certainly the lipid profile has a lot to do with it.

PETER SCHOLZ, M.D.

What has the blood pressure been during all the manipulations of the heart? Has he remained pretty stable during this procedure?

TYRONE KRAUSE, M.D.

Yeah. We have the blood pressure now at 135/74. Initially we got the blood pressure down, as Dr. Plotte mentioned, when we put the clamp on the aorta, which is up here, we want to make sure the pressure is relatively low so we don’t damage the aorta. That is probably the site where strokes occur from the most. If there’s plaque there or any other
calcium of some sort, you can have some injuries to that, so you want to have the blood pressure not very high. When we do the distals, like we just finished, we usually have the blood pressure even higher, maybe 150, 160 if we can. We also intermittently use the echocardiogram and we can tell if the heart is distending and decide the wall is not beating as well as it should, so we can kind of get an early warning sign that that’s giving us a problem.

PETER SCHOLZ, M.D.

The interest in off pump surgery has been tremendous. There’s over 1,400 articles in the literature addressing off pump surgery, its safety and risks. There are studies that show there are less neurological events and less strokes and some that show there’s no major difference. Once of the reasons where there may not be a major difference is if you have to put a side-biting clamp on the aorta; that is, manipulating the aorta, even though you’re not on bypass, you still manipulate the aorta, so the stroke incidence is probably less, but it’s not 0 either with this procedure.

TYRONE KRAUSE, M.D.

With any surgery, there’s always a risk of that. It’s unclear what the cause ultimately is, if it’s related to the blood pressure shifts from general anesthesia itself, but you’re right, it certainly doesn’t drop anything to 0.

PETER SCHOLZ, M.D.

Well, the young crowd is really getting into it. Here’s a five-year-old and she says this is really cool, but it’s really gross too. She wanted to know if the heart always looks like this or is it only because the heart is diseased? No, hearts usually look like this. They have the fat on it. That’s what that yellow stuff is. We don’t have to remove that. But you can see how the heart is beating strongly during the whole operation and keeping the patient alive.

TYRONE KRAUSE, M.D.

His heart, as I mentioned, was a little abnormal by his echocardiogram and during the catheterization. The ejection fraction, which is the measure of a normal heart, is normally around 60%. That’s the amount of blood ejected per beat. This gentleman, his ejection fraction was about 40%, so it was decreased a little bit, based on his coronary disease. Although it looks normal from the outside and certainly looks happy, I think the coronary disease itself probably accounted for his lowered ejection fraction. We’re hoping a lot of that gets better. Most hearts will get better when you re-route the blood. It may be in a hibernating state where it’s lying dormant and not totally scarred, so hopefully when the cardiologist repeats the ejection fraction measurement, it’s improved.
We’re actually just finishing the last proximal anastomosis, which means we’re almost done. Usually an operation for triple or quadruple bypass takes about an hour, an hour and 15 minutes. We’re just putting our last stitches into this and then we’ll be done.

PETER SCHOLZ, M.D.

That just points out that you actually save time in the operating room too. We don’t have to spend time getting on the heart-lung machine, coming off the heart-lung machine, making preparations for that.

TYRONE KRAUSE, M.D.

I think certainly if you have everybody working in concert, it can be a quicker operation and hopefully less traumatic. I would think that less time would translate into an improved postoperative course.

PETER SCHOLZ, M.D.

One person wanted to know, because the heart’s beating, is the patient actually awake with this operation? The answer is no. The patient is asleep. That’s why we have the anesthesiologist in the room. There have been some operations done occasionally with spinal anesthesia and the patient awake, but that is not a very common procedure.

Right now we’re finishing up the operation. All the vein grafts have been hooked up to the aorta and we’re just making sure that there’s no extra bleeding before we start closing. Dr. Krause has just put an additional stitch in to make the anastomosis watertight so we don’t have any bleeding after surgery. Actually, the blood loss and blood transfusion requirements are significantly less. That’s one of the advantages of this off pump procedure.

Neelish wants to know how long it takes to become a heart surgeon and how long your residency is and do you have to go through special training to learn some of these new procedures. I think the answer is important to remember, that it takes a long time to train for certain specialties, especially heart surgery. You have to go through medical school and then you have to do a 5-year residency and then usually a 2-3 year residency in thoracic surgery after you’ve completed your general surgery, so you’re spending anywhere from 8-10 years after you finish medical school. Then, when you attempt to do new procedures like this, you have to go through a learning phase and courses to be able to do it safely.

TYRONE KRAUSE, M.D.

We have one of our proximals, we just want to put an extra stitch in.

PETER SCHOLZ, M.D.
We offer a wide variety of services for adult heart surgery patients. We have been performing heart transplantations for a little over three years. As you can see, we do on and off pump bypass surgery. We have a well respected center for valve surgery, where we repair complex leaky valves, mitral valves, aortic valves, replace diseased valves that can’t be repaired using the latest valve substitutes. We also have expertise in repairing adults who have congenital heart disease and have embarked on an arrhythmia surgery program where we surgically treat atrial fibrillation and other arrhythmias, implant pacemakers and defibrillators, and we’re also a major trauma center, where we deal with blunt and open cardiac trauma.

Robert Wood Johnson Hospital was founded in 1994 and now is a 567-bed tertiary and quaternary referral center in the center of New Jersey. We have a 260-bed hospital within the hospital that is a heart hospital that allows us to provide some of these specialized services.

As you can see, that little mister that was handy for the distal anastomosis also is very helpful to improve visualization when you’re completing the proximal anastomosis on the aorta.

Now that the bypass operation is completed and the heart is working well and has its blood flow restored, it will take probably about another half hour or two to make sure all the bleeding is stopped and controlled and closing the chest.

TYRONE KRAUSE, M.D.

The proximal anastomosis is done. What we do is just check the distals, which all look pretty good. Then we go around the back of the heart. This is our bypass. We’re going to look at one that’s on the bottom of the heart. That’s going to lie like that and that’s going to lie like that. Now we just put chest tubes in and we’re all ready to go. We give Protamine at this point, which is the antidote to the Heparin, to counteract that. The Heparin, as you know, we started early on to minimize clotting during the clamping of any of the arteries. So now we’re going to give the Protamine, we’ll put our chest tubes in, and we’ll be all set.

PETER SCHOLZ, M.D.

I guess we can close with the last email, from a fan of yours that you operated on back in February. He wanted to let you know that he’s doing well and how much he appreciated you giving him a new life with successful off-pump bypass operation.

TYRONE KRAUSE, M.D.

Great. Did he have a question?

PETER SCHOLZ, M.D.
No, he just wanted to compliment you and the team, but he did understand that it is a team approach and how important the team is.

Dave wanted to know what’s the largest number of bypass grafts you’ve ever done on one patient.

TYRONE KRAUSE, M.D.

On one patient, 6. With off pump, I did 5. But as you know, basically everyone’s born with 3 main arteries, so after 3 arteries are bypassed, I’m not sure how much benefit you can get, but the number of arteries, I’ve seen people do 7, 7 big arteries. That’s kind of the limit, though.

PETER SCHOLZ, M.D.

But I think it does point out that if you plan correctly and you have a good system in place, you can actually do as many bypasses off pump as you can on pump and that is not an indication.

TYRONE KRAUSE, M.D.

I think that’s a main question, can you do the same amount? The most important thing, I think, about it is that you have to be able to do the same kind of job. Otherwise, you should have to go on the heart-lung machine to do it. I mean, if there’s a message to take from any of this, it’s that you don’t want to cut corners on the patient’s health by not doing enough bypasses, whereas on pump you can, which just comes over time and with skill and the team approach.

PETER SCHOLZ, M.D.

One email wanted to know if there’s blood flow going through the artery while you’re performing the anastomosis. I think that’s why it’s important that you bypass the most severely blocked areas first, to maintain a stable heart. Like I showed earlier, we have these little shunts that we use that will actually maintain blood flow through the artery while you’re doing the anastomosis if the patient becomes unstable, so not only if there blood flow going through it, but it’s a relatively short period of time that the blood flow is interrupted. Patients usually tolerate it and, if not, then there are other methods of improving flow.

TYRONE KRAUSE, M.D.

I’d just like to thank everybody for watching. We’re basically finished here. Everything looks great.

PETER SCHOLZ, M.D.
I wanted to say goodbye from Robert Wood Johnson and thank everybody for watching this live webcast from New Brunswick. I want to remind everybody that this program can be viewed on the website in an archived version shortly and you may want to point this out to your friends and neighbors. Thank you and good day.

NARRATOR

This has been a live off pump coronary artery bypass procedure performed live at Robert Wood Johnson University Hospital in New Brunswick, NJ. For more information, to make a referral, or make an appointment, click on the buttons on the player window.