Each year over one hundred thousand Americans undergo aortic and mitral valve surgery. During this live webcast, surgeons from Texas Heart Institute at St. Luke’s Episcopal Hospital in Houston, TX, will perform, over the Internet, an aortic valve replacement procedure with a new Medtronic Mosaic ultrabioprosthesis.

We’re talking about implanting the Medtronic Mosaic valve in the aortic position. It’s a porcine valve and it’s been used rather extensively around the country and around the world. It’s recently had some improvements made to it in the size of the sewing ring, so that we’re able to use it in a slightly smaller annulus.

The latest generation of bioprosthesis has been shown to provide excellent hemodynamic outcomes and lasting durability. They also allow patients to live active lifestyles without the risks of anticoagulation therapy. At any time throughout this program you may email questions to the physicians by clicking the MDirectAccess button on the screen.

Hello, everybody. Welcome to the Texas Heart Institute’s live webcast. Today we’ll be performing an aortic valve replacement using a 3rd generation bioprosthesis. I’m Dr. Ross Reul, Director of Surgical Innovations at St. Luke’s Episcopal Hospital and the Texas Heart Institute. I’m joined by Dr. Denton Cooley, President and Surgeon Chief of Texas Heart Institute and the Chief of Cardiovascular Surgery at St. Luke’s Episcopal Hospital. Dr. David Ott will be performing today’s procedure. Dr. Ott, can you introduce your team in the OR for us, please?
DAVID OTT, M.D.

Thank you, Ross. Today our team consists, as always, of about 10 people. Dr. Pan and Dr. Kiser, anesthesia. Brian and Amy running our perfusion service. Michelle and Rhonda running the instruments and I’m assisted today by Senior Resident Mike McBride and Jack Lye, physician’s assistant. We’re operating on a 70 year old man, man in his 70s who has had shortness of breath for about a year and has been found to have aortic stenosis with a valve area of .7 cm, mean peak gradient of about 70 mm of mercury. We’re going to use a full incision today in the interest of better exposure for our viewers and we’ll proceed.

ROSS REUL, M.D.

Thank you, Dr. Ott. While we’re getting started, I’d like to discuss some of the issues that go into choosing an appropriate aortic valve replacement device. You can see here, we’re doing the standard sternotomy incision, but for a valve that is not repairable, we can choose either a mechanical or tissue valve. There are various types of mechanical valves on the market and there are various tissue valve choices, including either a porcine valve or a pericardial valve. The porcine valves can be stented or stentless. The other options include human valves, including homografts and the patient’s own pulmonary autograft, which requires replacement of the pulmonary valve with the homograft. Prior to choosing the type of valve that we use, extensive discussions need to be undertaken with the families and with the patient regarding the lifestyle issues and the risk inherent to each type of valve. Dr. Cooley, do you have any comments for us about the types of valves we choose?

DENTON COOLEY, M.D.

Well, we have a choice of the type of valve depending on a number of factors, partly the patient’s age and body habitus and so forth. But one of the advantages of the biologic valves, which is this porcine valve here, is usually the patient does not have to prevent thromboembolic complications forming on the valve, therefore he does not have to take anticoagulants which have also certain complications which go along with that procedure. The possibility of repairing a calcific aortic valve is always present, but we’re going through a period where attempts were made to actually decalcify a valve—such as you’ll see in this patient—by using various ultrasound instruments, but that experience indicated that the benefits were rather temporary. By using a complete valve replacement, an artificial valve, then the patient gets much more permanent relief.

You can see the various types of valves which are available. The mechanical valves of various types, using the pyrolyte carbon, which is an unusually good substance, which has long durability. But it does have a tendency, these valves do have more of a tendency to develop clots around the hinging mechanism. The biologic valves have that particular advantage, that they do not have to be anticoagulated afterwards since they have a very low tendency to develop blood clots. Another advantage of the biologic valves, or say the
porcine valve, is that it is silent. Sometimes patients are aware of the clicking noise with the mechanical valves which is not present when a biologic valve is used. Another possibility other than using, say a heterograft valve usually from a pig, is to use pericardium, specially treated pericardium usually from a calf. That is fashioned into a form similar to a biologic valve. Those are the options which are available to the surgeon and he must use his judgment as to which would be appropriate for the individual patient.

ROSS REUL, M.D.

Thank you, Dr. Cooley. I think that our choices in valve options have changed over the years, mainly as the risk profile of each valve has changed. In the past, I think about 60% of the valves put in the aortic position were some sort of mechanical prosthesis and about 35% or so were bioprosthetic valves and that seems to have changed over the course of the last decade or so as we’ve learned more about the longevity of the newer generation tissue valves and more about the complication rates of the mechanical valves. In the past a lot of the guidelines had said that anybody over 70 should get a tissue valve and anybody under 70 should get a mechanical valve, except for various changes such as a young woman of childbearing age who still wants to have children. But nowadays more and more we’re looking at using tissue valves in younger and younger patients. I think the risk profile and the freedom from structural valve deterioration over years has allowed us to make these options. We make these options available to our patients. As we discuss the options with our patients, we need to let them know what the expected longevity of this valve is compared to their expected life average and cue that in with their lifestyle. Whether or not they can take anticoagulants long-term or whether they would like to take anticoagulants long-term and more and more active patients in their 50s and 60s are choosing biological valves based on the risk profiles of the mechanical versus the biological valves. So I think there’s been a shift in the last decade or so towards using biologic valves in younger patients.

Recently in a major international cardiac surgical meeting, a poll was taken of the audience as to if you were 55 or 60 years old and you were faced with an aortic valve replacement, which type of valve would you choose? About half the hands went up for a mechanical valve and about half the hands went up for a tissue valve, so I think the paradigm has shifted somewhat.

DAVID OTT, M.D.

You want to try to lower the pressure just a little bit?

ROSS REUL, M.D.

Dr. Ott, what are your thoughts after seeing this gentleman’s aorta?

DAVID OTT, M.D.
Well, his aorta is slightly enlarged. It’s nice and long and I think we’re going to have a fairly sizable annulus here once we get in to look at this valve. I think it’s certainly true that we’re moving more towards tissue valves in younger patients. Certainly someone who’s in their late 50s or 60s who’s quite active and does not want to take Coumadin or be exposed to the risks of taking Coumadin would want to consider a tissue valve. There’s a lot of things that enter into it, of course.

ROSS REUL, M.D.

I think part of choosing which valve is not only taking into account the need to take a pill every day with the Coumadin or whether or not you have to go to the lab and get your blood checked. There’s also other complications that occur with mechanical valves and as we discussed, there’s an inherent thrombogenicity of the mechanical valves that you don’t see as much with the tissue valves. In addition to embolic events which can result in strokes or loss of blood flow to the limbs or kidneys, we also see episodes of valve thrombosis which can occur if the Coumadin levels aren’t kept up to a certain level therapeutically. When we’re taking Coumadin, we are at a higher risk for bleeding, obviously, than if we don’t have to take Coumadin. Then the other risks inherent to any type of valve replacement include endocarditis and need for reoperation for those kind of problems. The benefit of the mechanical valve is that we don’t have to worry so much about a structural valve deterioration, but sometimes these valves need to be replaced for perivalvular leaks or panucin growth or for endocarditis. But most often the mechanical valves are built to last well beyond the patient’s lifetime. The tissue valves, on the other hand, do have an inherent structural deterioration when placed in a human body and the longevity of those valves seems to be different with different ages and that’s why we’ve been discussing the patient’s age in detail. In patients who are 70 or older, most studies have shown that the newer generation tissue valves have excellent long-term durability, whereas patients who are in their 20s or 30s may have a much higher rate of structural valve deterioration at an earlier time. So all of these discussions must be had with the patients preoperatively and to really get an understanding of whether the patient wants to take the risks of a mechanical valve versus the risks of a reoperation later on.

DENTON COOLEY, M.D.

It appears that he’s just gone on cardiopulmonary bypass and in the next few moments, you’ll see them cross-clamp the aorta and then introduce a cardioplegic agent to stop the heart so that they can have a dry operative field free of blood so that they can see and make a precise sort of repair and replacement of the valve.

ROSS REUL, M.D.

Now, Dr. Ott, I see you’re placing the retrograde cardioplegic cannula now. What is your preferred technique of cardioplegia and arresting the heart and preserving the heart?

DAVID OTT, M.D.
I was going to say that we’ve just inserted this retrograde cardioplegia line and that will allow us to give cardioplegia solution both down the aorta and retrograde through the coronary sinus. We generally give about 500 cc antegrade and then about 500 cc retrograde. I think that allows us to stop the heart and preserve cardiac function.

Now those of you who are not familiar with cardiac surgery, we’re about to go on the bypass machine now and the blood is going to go out the right side of the heart, circulate through the machine, pick up oxygen and give off carbon dioxide—ready to go on, Brian? Ready.

ROSS REUL, M.D.

I’d like to take this opportunity to remind the viewers that you can send your questions by clicking the MDAccess button on your screen. This way you can send questions and ask the surgeons any of your questions. So please do that at your timing.

DAVID OTT, M.D.

So, you want to zero this?

ROSS REUL, M.D.

Dr. Ott, would you like to discuss what your incision on the aorta will be?

DAVID OTT, M.D.

What our incision will be?

ROSS REUL, M.D.

Yes.

DAVID OTT, M.D.

We’re going to, of course, put the clamp on and give cardioplegia and we usually make a—flush, you want to flush it?—we usually make sort of a u-shaped incision on the aorta, staying well above the coronaries, of course. Flush, please.

ROSS REUL, M.D.

We have a question here that was sent in via email. The question is: my father is 64 years old and has moderate aortic valve stenosis. Eventually he will require valve replacement surgery. He is not excited about the thought of blood thinners, yet he is concerned about potential reoperation, given his age and otherwise good health. Do the newer tissue valves last longer and would you recommend this Mosaic valve over a mechanical valve? If so, why?
DAVID OTT, M.D.

Ross, if you’re asking me, I think that certainly the newer tissue valves have better longevity and the figures, I think, indicate that about 85% of people will still be free of any further need for surgery after about 15 years. So there’s about a 15% chance that the patient might need further surgery—Clamps on now. Give the cardioplegia—So I think certainly at age 60 or 65, I personally would be strongly considering a tissue valve. As a matter of fact, I’m in my 50s and I would probably take a tissue valve if I had to have one tomorrow. Particularly if you have a relatively active lifestyle and want to avoid the problems that Coumadin can bring. Want to give about 500 antegrade and 500 retrograde.

ROSS REUL, M.D.

I think it looks like most of the studies on the newer tissue valves have shown just that, in a patient who’s between 60 and 70 years old, we often see about close to 85% freedom from structural valve deterioration at ten years and now even getting up close to 15 years with the 2nd generation valves and now we have some data on the new 3rd generation valves which look very promising, as well as the theoretic benefits of the anticalcification techniques. The Mosaic valve, which we’re planning on using today has a couple of different ways that they’ve developed to try to decrease the risk of structural valve deterioration where the valve breaks down and needs to be replaced. One of these is the fixation process is now done at physiologic pressures instead of high pressure or zero-pressure fixation. That helps to take some of the tension off certain pressure points on the valve leaflets. The other thing they have is the AOA anticalcification treatment, which now, this new technique allows a covalent bonding which keeps the preservative from leaching out of the tissue over time and theoretically this should improve the longevity of these valves. So I think that patients can understand that they no longer are looking at about a median lifespan of the valve of 7 or 8 years as some of the 1st generation tissue valves have shown. But more and more, I think in a 64-year-old gentleman, I think the option of a tissue valve is definitely a very strong option.

DAVID OTT, M.D.

You’ll see here that this catheter here is the cardioplegia going antegrade into the aorta and we’re done with that now, so we’re going to take that out. We’re still giving retrograde through this cannula here that I’m grabbing with my pickups. I have a catheter here that suctions blood out of the heart to keep it dry once we get in there. Give us better exposure. We’re going to make our incision on the aorta here, coronary orifices are about where my scissors are and we’re going to make an incision above that. And then we’re going to angle this incision down towards the non-coronary cusp. We might make a little bigger incision than usual here in order to show where we are. Let me have a stay-stitch, Rhonda, I think it might help. Now, Mike, use this—

ROSS REUL, M.D.
As Dr. Ott is exposing the valve here, we’ll be able to see the very diseased leaflets of the aortic valve and the transesophageal echocardiography preoperatively showed this to most likely be a tri-leaflet valve, which is the normal configuration of our aortic valve.

DAVID OTT, M.D.

I think, Ross, that in fact this is going to be a bicuspid valve here. You can see, I hope you can see on the video, this is one leaflet here. It turns out that the other leaflet—there should be two leaflets here, and they’re fused. Completely fused and calcified. The aortic valve should be just like little fine, like a Kleenex, little piece of tissue paper. And these are thick and calcified. You can also see the orifice of the left coronary artery right there. If I can, I’ll show you a trick that I learned from Dr. Cooley many years ago. And that is how to get the valve out fairly cleanly.

DENTON COOLEY, M.D.

:00 David, you see this is a bicuspid valve. Has the patient always been aware, throughout his life, of a murmur, an aortic valve murmur?

DAVID OTT, M.D.

I think, Dr. Cooley, he has had a murmur for a long time but was not totally aware of that. I’m going to show you now we can just pull this out without doing much cutting. We just push with it. And the valve will sort of peel out. I learned that from Dr. Cooley when I was a resident and I’ve shown it to a lot of surgical residents since then. We’ll do the same thing with this leaflet. We’ll cut a little bit and we’ll push a little bit.

ROSS REUL, M.D.

This technique that Dr. Ott is showing is extremely useful. As he said, he learned from Dr. Cooley and Dr. Ott taught me when I was a resident. This technique is extremely useful for getting the valve out of the annulus in a very clean fashion without getting into the wrong plane which can have very difficult consequences. You can see that leaflet that he just pulled out was extremely thickened and calcified. If you can show the viewing audience that is in no way a normal appearing leaflet.

DAVID OTT, M.D.

Here are the leaflets that we’ve taken out. Filled with calcium. Really a mess.

ROSS REUL, M.D.

So the bicuspid leaflets that Dr. Ott was showing you is a congenital difference that patients are born with two leaflets instead of three. Typically this can cause an earlier degeneration of the aortic valve where patients, by their fourth or fifth decade, start to have some changes on the aortic valve, usually from the trauma of the blood flow and
there may also be some inherent differences in the fibers of the valves as well. Often patients with a bicuspid aortic valve will begin to develop calcification and changes that lead to aortic stenosis and require surgery.

DAVID OTT, M.D.

A little bit of saline, maybe? We’re going to wash this area out a little bit, just with some saline. We want to make sure that we get all of this material out of there. You can see, perhaps, the mitral valve down here. This mitral valve is pretty normal. Mitral valve with its chordae. Valve sizer?

ROSS REUL, M.D.

the mitral valve.

DAVID OTT, M.D.

Dr. Ott, could you comment to the audience on what you like to see when you’re sizing the valve while you make your choice?

DAVID OTT, M.D.

We have these sizers that we’ve used here for years. I think Dr. Cooley probably designed those a long, long time ago. And that’s a 29 sizer. And then we also have the sizers from Medtronic. And that’s a 29. We like to see it go in easily. We usually teach the residents the three rules of valve surgery. The first rule is don’t put in too big a valve and the second rule is don’t put in too big a valve and the third rule is don’t put in too big a valve. So we try to be fairly cautious about that. I think we’ll put in a 27 Medtronic Mosaic here which will be plenty big enough for this man. You can see his annulus here is fairly clean and we’ll be able to sew this valve in rather nicely. This is the orifice of the left coronary and the orifice of the right coronary, of course, is right up here. What we’ll do here on the tissue valve—we’ll need to wash this valve off because they’re stored in glutaraldehyde and we need to wash the valve off. Jack is going to do that while we’re putting these sutures in.

DENTON COOLEY, M.D.

David, we have two questions here related to the age that came from patients. One patient says, “I’m a 20-year-old pre-med student and in the next month I will be undergoing aortic valve replacement. Which valve should I choose? A bioprosthetic valve as opposed to a mechanical valve?” Well, you do have a choice there, I think. Personally, I would recommend in a 20-year-old that he have a mechanical valve, a synthetic valve because of the durability. He has a life expectancy of 30-50 years and I think that he would like to have a nice, durable valve. But he would be required to undergo anticoagulation, which might be a handicap to him depending on his expectations for what type of physical activities he’d be involved with.
The next is from a patient who’s 41 years old. He enjoys an active lifestyle. He seems to lean, himself, toward a tissue valve. I would agree, too. At that age, now, and with the type of valve that this Mosaic valve has become, that’s a reasonable decision to use a tissue valve.

DAVID OTT, M.D.

You can see here that we’re now running, the profusion team is giving some more retrograde profusion and that’s the blood that you can see coming retrograde out of the orifice of the coronary arteries. That’s what that blood is there. I had an interesting patient one time. A very bright female in her 30s who had yet to have children and wanted to have children. We discussed thoroughly all the various valve types that might be appropriate for her and she, in fact, elected to have a tissue valve.

DENTON COOLEY, M.D.

David, let me interrupt you for a moment. You’re right there in a critical part of the replacement process. You’re right where the AV conduction bundle is rather vulnerable. Could you make a comment about how you place the sutures at that point?

DAVID OTT, M.D.

That’s a good point, Dr. Cooley, and I guess the answer is: very carefully. Right here is what Dr. Cooley refers to. This area would be the area where you could potentially develop heart block. So we’re going to put our sutures relatively superficial here.

ROSS REUL, M.D.

I’d like to again remind the audience that their questions can be sent to the surgeons here by clicking the MDirectAccess button on your screen.

DAVID OTT, M.D.

We’re reversing here now and putting some sutures on the other side.

ROSS REUL, M.D.

Dr. Ott, would you like to comment on your choice of suture technique here? Evertong versus noneverting and pledgets—

DAVID OTT, M.D.

Yes, we’re using sutures here that are pledgeted sutures from below the annulus. Good example here of how you have to hold the needle to do this particular stitch. This man has a large annulus. In a smaller annulus we might choose to use these horizontal mattress
sutures, perhaps without the pledgets or we might even use simple sutures. This annulus is pretty good size and we certainly can use the pledgeted sutures here. This is certainly the best suture technique as far as preventing any perivalvular leaks are concerned. One more.

ROSS REUL, M.D.

Dr. Cooley, you showed me the running suture technique on the aortic valve before. Would you like to comment on that?

DENTON COOLEY, M.D.

Well, I used to use that because it was simpler, it seemed to me, particularly in patients who had a dilated aortic annulus, annuloaortic ectasia, something like that. I don’t think it makes a great deal of difference, just so the sutures are placed precisely and close enough together so there won’t be a valve disruption.

DAVID OTT, M.D.

Let’s have our valve, please.

ROSS REUL, M.D.

And they’re going to bring in the valve right now. Which valve have you chosen, Dr. Ott?

DAVID OTT, M.D.

Now this is a 27 Medtronic Mosaic. We like this valve. We made some suggestions about making the sewing ring smaller and the company took our suggestions to heart and I think they got a very favorable response from other surgeons. We like it because it has a small sewing ring, we can get it into a bigger valve and a smaller annulus. We also like it because it’s scalloped, it has a nice, scalloped shape as the native valve does. It also has a relatively low profile from the standpoint that if you’re worried about obstructing the orifices of the coronary artery that can be a problem in aortic valve replacement, this valve is very favorable in the smaller sizes because there’s not much sewing ring or other portions of the valve that are likely to obstruct the orifice of the coronary, a pretty important thing to be careful of in aortic valve surgery.

DENTON COOLEY, M.D.

I notice that you’re alternating blue and white sutures there to help avoid entanglement.

DAVID OTT, M.D.
Dr. Cooley, sometimes surgeons need all the help they can get. We try to alternate the colors as much as possible. It keeps us from getting confused. That was a good idea. Was that your idea a long time ago, Dr. Cooley or was that—whose idea was that?

DENTON COOLEY, M.D.

I believe I did. Yeah. Not a real major contribution, but I’ve always thought try to get things as simple as possible.

DAVID OTT, M.D.

Absolutely. One of Dr. Cooley’s great contributions, probably, maybe, perhaps the greatest contribution to heart surgery in my opinion, is that Dr. Cooley has figured out the simplest and most straightforward ways to do things and that’s practically always the best. Keep it simple and come out ahead.

ROSS REUL, M.D.

Well, we’re going to go back to one more question here from the emails. This question states, “How long will the patient be on blood thinners? My 87-year-old mother had her aortic valve replaced earlier and is still on Coumadin. This is now three months later. And Toporol XL as well.” I think the answer to that question depends on a number of factors. I’m going to assume that this was a bioprosthetic valve replacement and make my discussion based on that assumption. There are several surgeons and several cardiologists who will place patients who had a bioprosthetic valve on Coumadin and some who will just use anti-platelet agents such as aspirin. The studies haven’t shown a major difference in risk of thrombogenicity early after surgery. That tends to be a surgeon- and patient-preference decision. But if there are other complicating issues which require Coumadin, such as atrial fibrillation or deep venous thrombosis or some other condition that requires Coumadin, that Coumadin might need to be continued long-term, even in the setting of a bioprosthetic valve.

DENTON COOLEY, M.D.

In a patient that age, there are other considerations involved, but I do believe that it’s the choice of the surgeon and the cardiologist who follow the patient as to what sort of a program or regimen they prescribe after the surgery.

DAVID OTT, M.D.

This valve also has a new holder that’s been designed so that you can pinch the struts down, it can sometimes help seat the valve a little bit easier. It’s usually not a major problem anyway, but—

ROSS REUL, M.D.
It is very helpful as you’re tying the stitches down in patients with a relatively narrow sinotubular junction to avoid squeezing your finger down between the aorta and the valve struts. It also helps in the mitral position with another type of cinch that they have that keeps the struts out of the sutures. So that’s been a somewhat helpful addition to the valve.

How do you like to place this valve? Do you like to place it in the annulus itself or to sit on top of the annulus?

DAVID OTT, M.D.

Well, I guess some of these valves—Okay Brian, let’s stop that now. Some of these valves do, in fact, sit on top of the annulus, but so many times there’s a relatively small annulus and there’s not really a shelf on top of it. We’re going to seat this valve now. We’re going to put this valve in and you kind of put it in like you’re putting a shoe on. Just push it down like that with this holder. I, in fact, like to take the holder off at this point. Pickups. Okay.

ROSS REUL, M.D.

You can see here the leaflets of the porcine valve. It’s a tri-leaflet valve and you can see the very thin leaflets as opposed to the big, thick, calcified leaflets that we took out of this patient. This is close to what the human aortic valve tissue looks like.

DAVID OTT, M.D.

This valve does look very similar to a normal human valve, obviously, other than the Dacron struts.

DENTON COOLEY, M.D.

I have a question here which might be of interest to the listeners. This is from a 55-year-old patient who had an aortic valve replaced three weeks ago and he chose a mechanical valve. The valve that was implanted was a special carbon valve in which the thrombogenicity seems to be lower than the other carbon-type valve. There’s been an investigative procedure underway, a project underway in South Africa about just using aspirin as an anticoagulant postoperatively. Although those results are impressive at this time, they have not been confirmed by others. It does seem very promising, however, that this valve will function adequately with simple aspirin as an anticoagulant. In that regard, I remember two patients of mine who have been going 30 years with a mechanical valve and have never taken either Coumadin or aspirin. So there’s a wide variability in this complication. I think the best that this individual can do is follow the advice of his cardiologist. Hopefully he will be able to avoid any complications if he continues just taking the simple aspirin tablet every day.

ROSS REUL, M.D.
We have known several patients who have never been able to get their Coumadin levels just right as well and not only the patients that you referred to who never knew what Coumadin was, but several patients who either chose to stop taking their Coumadin or for whatever physiologic reasons could not keep their Coumadin at therapeutic levels and some of those patients are free of any thromboembolic problems. But I wouldn’t suggest that at this point because most of the data shows that you’re at higher risk for any kind of thrombotic or embolic event if you’re not at a therapeutic level. As the mechanical valves become more hemodynamically similar to the human design, we’ll probably see lower and lower requirements for Coumadin and maybe even no more need for Coumadin. Another interesting thing coming in is the home PT monitoring, which is the way that patients can monitor their Coumadin levels at home. The studies in Europe and several patients taking them here in America really like them a lot. It’s a way of monitoring your own therapeutic levels and altering your dose of Coumadin and that looks very promising for the patients who do require mechanical valves.

DENTON COOLEY, M.D.

We have for the past ten years been studying a special tri-leaflet mechanical valve which really is anatomically very similar to, say, the bioprosthetic or the normal human valve. As yet, though, that valve has not been approved for clinical application. But it seems to show some resistance to thromboembolic complications. We’re still hopeful that we’ll have an opportunity to try that valve on a clinical level.

DAVID OTT, M.D.

Here’s our last view before we close the aorta. We’ve got our valve in place. We can see the orifice of the left coronary, orifice of the right coronary up here. We’re going to close the aorta now.

ROSS REUL, M.D.

You can see the nice, low profile stature of that valve that doesn’t interfere with the aorta closure at all and doesn’t impede any of the flow to the coronary or osteo or flow through the annulus.

DAVID OTT, M.D.

We do use, we pay attention to the calculations of effective orifice area for the valves to make sure that we put in a valve that calculates to be of adequate size for the patient’s body surface area. We put in a valve here that, based on his body surface area, will function quite well for him.

DENTON COOLEY, M.D.
Dr. Ott, in this patient, do you think a 25 valve would have been too small for his body size or would it have made that much difference hemodynamically?

DAVID OTT, M.D.

Well, if you believe these tables, by calculation of effective orifice, 25 would have been a little small on this gentleman, but I think from a practical standpoint, it doesn’t make that much difference at this size level. Nonetheless, given the limitations of trying to put the biggest valve in safely, we do try to put in the biggest valve possible. But it’s better to err on the size of a little too small rather than trying to get a valve in an annulus where it doesn’t want to fit. That being said, we don’t do that many annular enlargement operations because with these newer valves it’s not often necessary. If we felt the need to, we wouldn’t hesitate to enlarge the annulus down across the non-coronary cusp with a little Dacron patch in order to obtain an adequate size valve.

ROSS REUL, M.D.

There’s a philosophy that we don’t want to replace a stenotic valve with a stenotic valve and in order to improve the patient’s likelihood of LV mass regression, using a bigger valve that’ll match the patient’s size is probably quite important. I think there’s still controversy out there as to whether size is important for survival overall in large cohorts of patients. I think you have to individualize it to the size, not only the size but also the activity level and expectations of the patient. Somebody who isn’t quite as active may not require as much output per beat as somebody who may be quite a bit more active. All of these things need to be taken into account when we’re choosing which size valve. Several options include enlarging the aortic annulus, which is a pretty simple, straightforward procedure most of the time, or sometimes even using a root replacement with either a Freestyle valve or another type of stentless root replacement which can also give you a much better hemodynamic profile in the situation where you are worried that you will end up with a patient-prosthesis mismatch.

DENTON COOLEY, M.D.

Dr. Ott, there’s been a recent interest in the Ross procedure. I know it was originally designed for younger patients. But what is your opinion about a Ross procedure for an adult patient?

DAVID OTT, M.D.

That’s a good question. I think—

DENTON COOLEY, M.D.

You might explain what the Ross procedure is to our listeners.

DAVID OTT, M.D.
Well, the Ross procedure is a procedure in which you take the patient’s pulmonary valve and move it to the aortic position. So using their own pulmonary valve, which is similar to the aortic valve but not exactly the same, you’re moving the pulmonary valve to the aortic position, which of course then means that you have to replace the pulmonary valve, usually with a homograft. And that, I think, is the Achilles heel of that operation. There are certain situations when it can be very useful, particularly in very young patients, I think. There is a great chance that you’re going to have to—you’re taking essentially one bad valve and making two potentially bad valves because you then have the chance that the new pulmonary valve in the aortic position is going to wear out with time and you also have to worry about the homograft valve that you used to reconstruct the pulmonary wearing out. I think that in most circumstances, it’s not the best option.

The green on? We’re going to take the clamp off. You’ve seen that the heart’s been still here. We’re going to take our clamp off the aorta. That lets oxygen back into the pulmonary arteries. You want to ventilate a little bit here?

ROSS REUL, M.D.

Dr. Ott, can you describe to the audience what you’re doing as far as deairing goes?

DAVID OTT, M.D.

:00 What we’re doing here is we have this catheter to get air out of the aorta. We’re getting air out of the left atrium where I had the sump and then we’re going to take a needle and get air out of the ventricles. The three potential places that there might be air in the heart, since we’ve opened the heart up, we need to—this is the left ventricle here. I’m going to put this needle in the left ventricle and we may bubble out a bit of air here. We want to—it’s very important to get all the air out of the heart. For those of you not familiar with heart surgery, because that air, if it gets into the system, is just like a blood clot. It can cause strokes and other problems. We’re going to put some pacer wires on here, these are temporary wires.

DENTON COOLEY, M.D.

Are you using esophageal ultrasound now to look for air in the chamber?

DAVID OTT, M.D.

We are. We have an esophageal ultrasound probe in this patient. We were looking at the valve a while ago with that. Then we’ll use that to monitor if there’s any need to make a further effort to insure that there’s not any air in the heart. These are temporary pacer wires that we’re putting in here. We’ll need to connect those.

ROSS REUL, M.D.
We have another email question here if we can take a second. The question is: with constant improvements in operating skills and technology making reoperations less likely, what age is appropriate for newer tissue valves? I think that we have made reoperations much safer as we’ve made the first-time operations much safer. In studies that looked at the operative mortality rates back about ten years ago, the operative mortality rates in many studies were over 5% and we’ve gotten those operative mortality rates down lower to the 3-3.5% range and even lower in many studies.

DAVID OTT, M.D.

Excuse me, I don’t know if the audience can see, but the heart is fibrillating here. I don’t know if you can tell, but it’s wiggling, it’s just fibrillating. That’s very common at this point in the operation. We’re going to take these paddles here and run some current through it and the heart’ll start beating. On 20, maybe? Okay, we’re going to need to give some magnesium here. This is where we had the catheter in to get the air out so we’re going to take that out in a minute.

ROSS REUL, M.D.

So as we’ve improved our surgical outcomes for both re-dos and for first-time operations, I think the viability of deciding on a tissue valve, even at an earlier age, and taking the risk of a reoperation over the other risks of mechanical valves or the other valve options is definitely a true option. There are other things that we’ve done to make the tissue valves last much longer, which improves this option as well. Not only the processing of the newer tissue valves and the new 3rd generation valves, but we also have learned through studies that lipid-lowering agents and possibly anti-platelet agents have also improved the longevity of tissue valves. I think we’re learning more and more how to make the tissue valves last longer and if you do need a reoperation in the future, the operative risks have kept getting lower so those are all good reasons to start thinking about having tissue valves at earlier ages. Even some surgeons used to think that a patient in atrial fibrillation would be a contraindication to a tissue valve because they are taking Coumadin anyways. Now with some of the new technologies we have to get patients out of atrial fibrillation, I think we can offer these kind of patients the possibility of a tissue valve and possibly getting off their Coumadin if they stay in normal sinus rhythm after these certain techniques. There’s also the risk of a patient coming off their Coumadin for reasons such as other procedures is higher in a patient with a mechanical valve than just atrial fibrillation. So even in patients with atrial fibrillation, they’re still candidates for receiving tissue valves even if they’re currently taking Coumadin.

DENTON COOLEY, M.D.

Dr. Reul, there’s been a lot of interest and publicity about limited access procedures for aortic surgery, for any kind of cardiac surgery. Will you make a comment about the use of limited access or even the robot, which is one of the techniques which is really being attempted in some other institutions.
ROSS REUL, M.D.

It’s a very good question. There’s a lot of interest out there today in using smaller and smaller incisions, trying to become less invasive in everything we do in surgery. We do use the robot for quite a few different types of operations, including mitral valve repairs and placement of left ventricular leads and all kinds of cardiac operations that we can do with very small incisions, endoscopic-assisted with the robot. The aortic valve replacement hasn’t quite reached prime time with the robot due to certain difficulties, it’s still in its experimental stages. But we definitely have several excellent options for smaller-incision aortic valve operations and the mini-sternotomy, which is performed through about a 7-8 cm upper mini-sternotomy, is an excellent option and it keeps the lower portion of the sternum intact. It’s definitely a smaller incision. It can be used for first-time or reoperations. It can be used for any kind of operation that’s done on the aortic valve or the root of the aorta, including homografts or bioprosthetic or mechanical valve replacements, ascending aorta repairs and things like that can be done. Double valves, these can all be done through a mini-sternotomy approach and we’re doing that more and more on patients who are the appropriate selected patients. Patients who don’t require concomitant aortic coronary bypass surgery or coronary bypass grafting, all these patients can be done with a smaller incision and probably quicker recovery times and a little less pain.

DAVID OTT, M.D.

You can see here—

ROSS REUL, M.D.

Can we see where we are in the operation?

DAVID OTT, M.D.

We’ve been giving the patient a little time to recover the heart function here. Now we’re contracting well and the rest of the operation will just consist of removing these cannulas, the venous cannula and the aortic cannula, and closing the incision up. This valve should serve this gentleman very well in the future.

ROSS REUL, M.D.

Are we able to see the echo from this angle?

DAVID OTT, M.D.

Can we show the aortic valve prosthesis on that? We’re going to try to do that, Ross.
Not quite off pump yet, but I’m not sure if it’s ejecting it.

DAVID OTT, M.D.

We’ll see if we can. This is a transesophageal echocardiogram. That’s the prosthesis in the middle, there. That’s the atrium above. These echos are always a little bit like magic for people that aren’t used to looking at them. This is a view of the—The color shows the flow across the valve and we use these echo-dopplers to demonstrate obstructions and leaks and holes in the heart. It’s a quite useful instrument that’s just come along in the last twenty years or so. We’re about to come off the pump here. What are we flowing now? We’re going to clamp the line and we’re going to be off the pump here. The patient’s back under his own power, so to speak. We appreciate you very much watching our operation today and I hope you learned something from it. I always do. Thank Ross and Dr. Cooley for participating. Thank you.

ROSS REUL, M.D.

This has been a live webcast of an aortic valve replacement with the Medtronic Mosaic ultrabioprosthesis from Texas Heart Institute at St. Luke’s Episcopal Hospital in Houston, Texas. For more information, to make a referral or make an appointment, click the button below.