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# ASK DR. GERDISCH ANYTHING!

Franciscan HEALTH

## Featured Speakers

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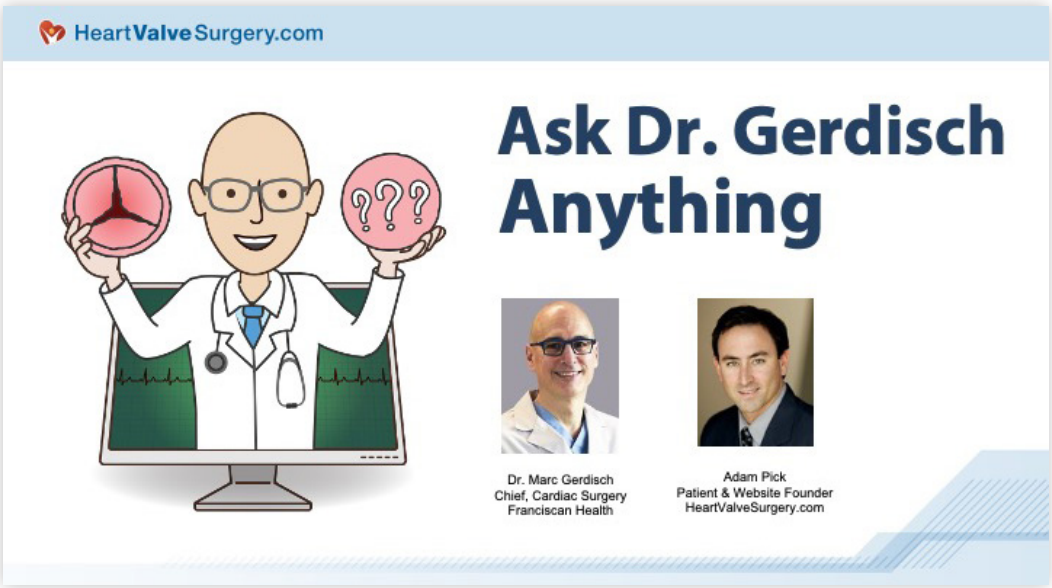
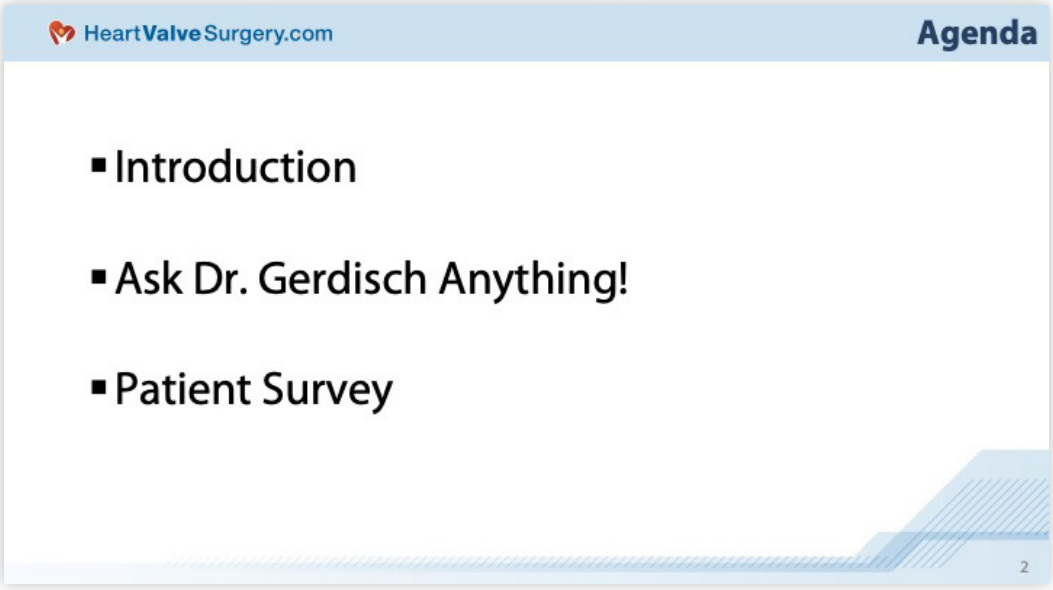
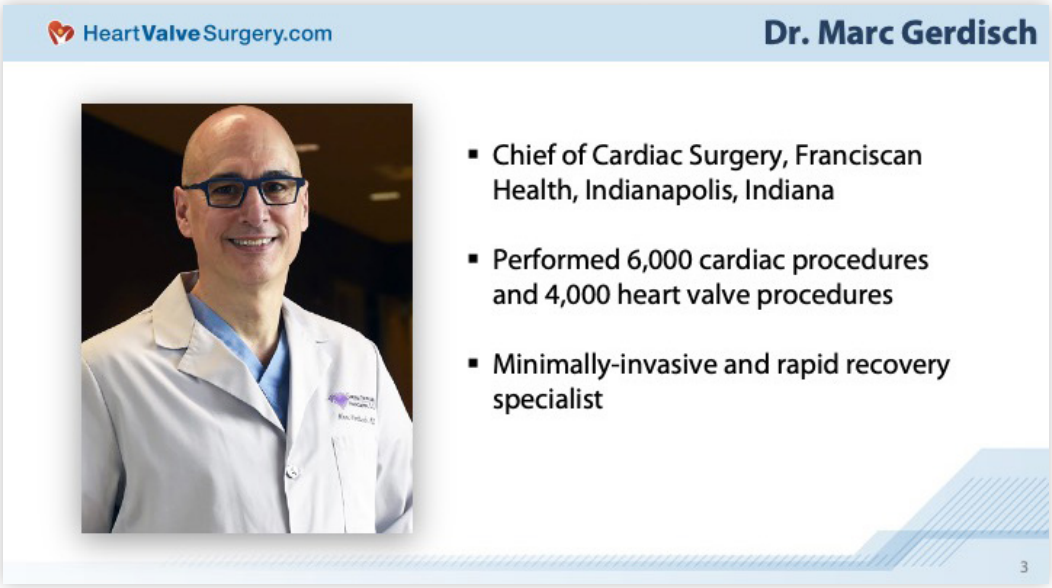
# Introduction




Adam Pick: Hi, everybody. My name is Adam Pick, and I'd like to welcome you to the webinar titled, "Ask Dr. Gerdisch Anything". If I have yet to meet you, I'm the patient who started HeartValveSurgery.com all the way back in 2006. The mission of our website is very simple. We want to educate and empower patients just like you, and this webinar which has had **over 550 registrations from patients** in countries all over the world was designed to support that mission. Throughout the webinar, you're going to be in what's known as "Listen Only" mode, but I would encourage you to submit your questions in the control panel that's up on your screen.



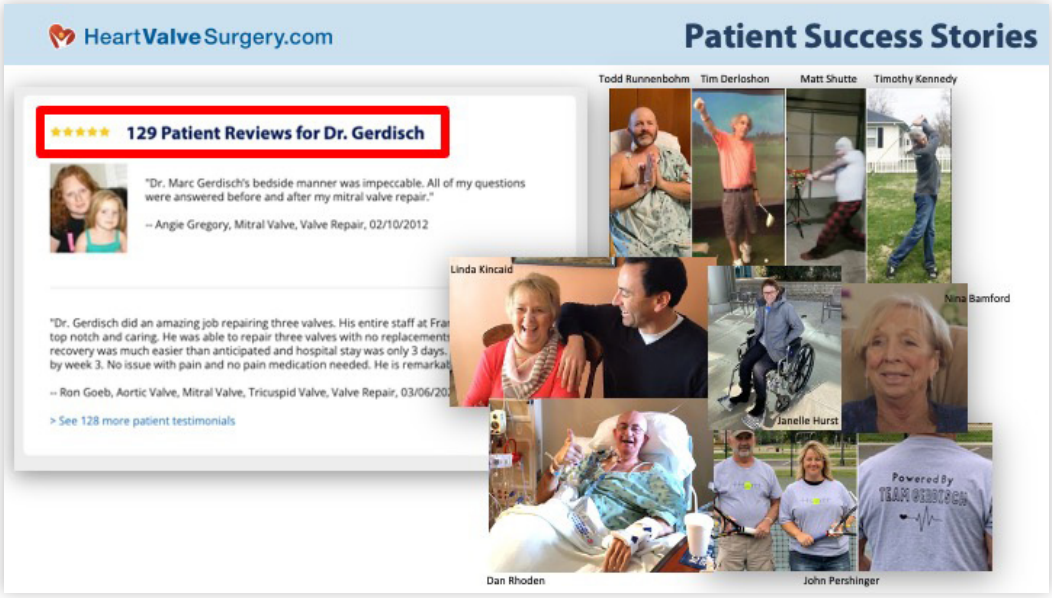

Adam Pick:  I'll explain why as we go into this agenda, which I have to tell you is the smallest agenda we have ever had for any webinar. What we're going to do today is I'm going to introduce our featured speaker. We are then going to go into a rapid fire ask Dr. Gerdisch anything mode. We're going to conclude with me asking you to complete a very quick five-question survey.




Adam Pick: When it comes to the featured speaker, I am honored; I'm humbled; I'm happy; I'm excited that we have with us today Dr. Marc Gerdisch. He is the Chief of Cardiac Surgery at Franciscan Heath in Indianapolis, Indiana. He's performed not 1,000, not 2,000, but 6,000 cardiac procedures of which more than 4,000 have involved some form of heart valve repair or heart valve replacement. He's a researcher. He's an innovator. What you're going to hear today are some of his specialties of minimally invasive therapy and rapid recovery.

He's so committed to the treatment of heart valve disease – yes, his license plate reads "HRT VALV", heart valve, and that's not a joke. I've seen it.


Adam Pick: To give you an idea of how committed Dr. Gerdisch is to heart valve therapy – he's already laughing, but I think it's just telling. His license plate is HRT VALV, H-R-T V-A-L-V. Are we in the right place today to get some excellent information, to get educated, and to get empowered specific to valve disease? I think so.




Adam Pick: I could go on about his accolades and all of his achievements, but this is the one thing that I really love showing people about Dr. Gerdisch. It's what patients say about him, and here at HeartValveSurgery.com, over 120 patients have had successful surgery with this man. You can see who they are here, whether it's Todd, or Tim, or Matt, or Linda, Nina, Janelle, Dan. John Pershinger goes out, makes shirts dedicated to Dr. Gerdisch.


Adam Pick: On behalf of our entire community, I can't tell you how excited I am for this session, and on behalf of all of our folks, I'd like to welcome Dr. Gerdisch to the call. Marc, thanks so much for being here today.

Dr. Gerdisch: It's my pleasure, Adam. It's really fun, and I really enjoy the opportunity to interact with folks. As I told you earlier, I had a full day at clinic today and thoroughly enjoyed getting to talk to 20 different people about their various valve disorders and sorting out plans and making – figuring out what the future's going to look like, so this is great for me. I appreciate being invited.

Adam Pick: Dr. Gerdisch, about being in clinic today. I'm sure people are wondering. How many people were in your clinic today, and how many of them are valve related patients?

Dr. Gerdisch: I saw 20 people and all of them are valve related conditions. It's essentially 100% of my practice. I think, actually, that number that we showed earlier, we're probably going to have reassess that. I think that number goes along with when I was as young as I was in that picture, so we're going to have to look at that again. Yeah, it's quite an honor. Thanks.

## TAVR Valve-In-Valve


Adam Pick: Why don't we do what we intend to do, which is answer patient questions. Let's go to the first one. It comes in from Cindy, Dr. Gerdisch. She asks a fascinating question which is, "Is a 21 mm valve big enough for a future TAVR valve-in-valve?"

Dr. Gerdisch: Right. As usual, great question. I just clicked on the Q&A there, and we're probably not going to get to all these fantastic questions. Every question in there is a really good question. I was actually getting excited reading some of them. Anyway, so this is – this goes to the center of our conversation around the patient, physiologic demands, their anatomy, their body surface area, and in this

case, we're talking about an aortic valve so their aortic – what we call the aortal annular architecture so the aorta itself, which is that main blood vessel that the blood is conducted through as it leaves the heart to go to the body, and then the annulus, which is the places where the leaflets of your valve attach – annulus defines that space, the space where the new valve can sit.

One of the things that we hear quite a bit is, well, you have to have at least a 23 mm bioprosthetic valve to accept a valve-in-valve later. Now, unfortunately, every one of these questions I can literally talk about for an hour. I'm going to try to constrain myself a little bit, but first of all, a 21 mm valve isn't the same in every 21 mm valve. If we compare devices across various companies, you will find that the internal dimension of the valve is different for different 21 mm valves. That's the first hurdle.

The next is, when we talk about a valve-in-valve, what is the construct of that valve like to accept a transcatheter valve? Different valves behave differently when they get a valve-in-valve inside of them, and different valves have different opportunities for expanding beyond what they were when they were implanted. Then the question becomes when you were – when the valve goes in – when that 21 mm valve goes in, is it in a constrained space where the sinuses or that first portion of the aorta are very close to the valve, and therefore, if anything goes inside of that valve later, there's no opportunity to expand and there's risk, actually, of occluding the coronary arteries, the blood vessels that feed the heart muscle, and what's the size of the patient? A 21 mm valve in a tiny person

might be plenty of valve and give them the opportunity for a valve-in-valve later and have enough room in the aortic root to accept that valve-in-valve. If that person's more medium sized, regular folk size, 21 is a little bit iffy. It might give you adequate human dynamics when first implanted, but over time, it will stiffen. Those human dynamics will change. You're going to need a valve-in-valve. Is there enough room in there? The bigger the valve you have when you have the surgery, the better the chances are to get a valve-in-valve later that will have plenty of room in it.

The final component to that is what is the strategy at the time of the valve-in-valve with respect to the – that individual's longevity. If we're talking about a valve-in-valve for, let's say, somebody who had a tissue valve when they're 65 – now they're 75. They still got another 10 or 15 years. Who knows? Now we have to have strategy where we really give them something that has some horsepower, and we need to have a big enough valve in there. We need to be able to put a big enough transcatheter valve in there.

It begins at the beginning, right? When a patient first gets evaluated for their tissue valve – for example, I saw a gal today who's 70 years old for whom we know we have to make that space bigger for her when we put her valve in. We're going to do – we're going to put a generous patch inside her heart and her aorta, or we're going to replace the entire root. We're going to make sure we put a big valve in there for so that when she does reach 80 and she needs another valve we know we've got the right size valve in there for her. All of that can be determined based on that patient's longevity, their comorbidities, and then looking intently at the aortal annular architecture. Adam, you've seen my images before the 3D reconstructions that we've been doing with DASI where we can

image the entire root. We can predict the size of the valve that'll fit, and we can make predictions even about what the valve-in-valve will look like later.

The prediction has to be made based on what the architecture looks like and the – and looking at that aortic root. What size valve is going in there and what the long-term plan is going to be for that? That's the answer.

Adam Pick: Yeah. For those folks who'd like to see what Dr. Gerdisch was just talking about, the DASI simulations, you can watch a webinar we did last year called How Artificial Intelligence Is Impacting Heart Valve Surgery. It's on the website, and you can tell – it's really just beyond amazing what Dr. Gerdisch is using these days to simulate how a valve will perform in a human body.

I've got to ask you this question, Dr. Gerdisch, as a follow up to this. When I was going through my procedure many years ago, all I thought about was a one and done. If I could get that, that would be my goal. Today, where everybody's planning about the lifetime management of valve disease, we got a lot of patients on the call. Are you seeing patients coming to you saying, hey, I want as big a valve so that I can plan for the future, or is this something that you bring about in the conversation with them? I want to know what your recommendation is for the folks on the line.

Dr. Gerdisch: It's something I tell them. Fundamentally, what I try to do is

put myself in their position or think of them as my brother, sister, whatever. Then construct what I think is the smartest long-term plan and then put in the framework also of their expectations, their wants and needs. There has to be a balance when we talk about, for example, minimally invasive surgery. There will be people for whom I can – we can replace their aortic valve through a little incision on the side of their chest, and they've got good size in there. The valve's going to go in, and we're going to have plenty of longevity of that valve. It'll be a valve-in-valve in the future if needed.

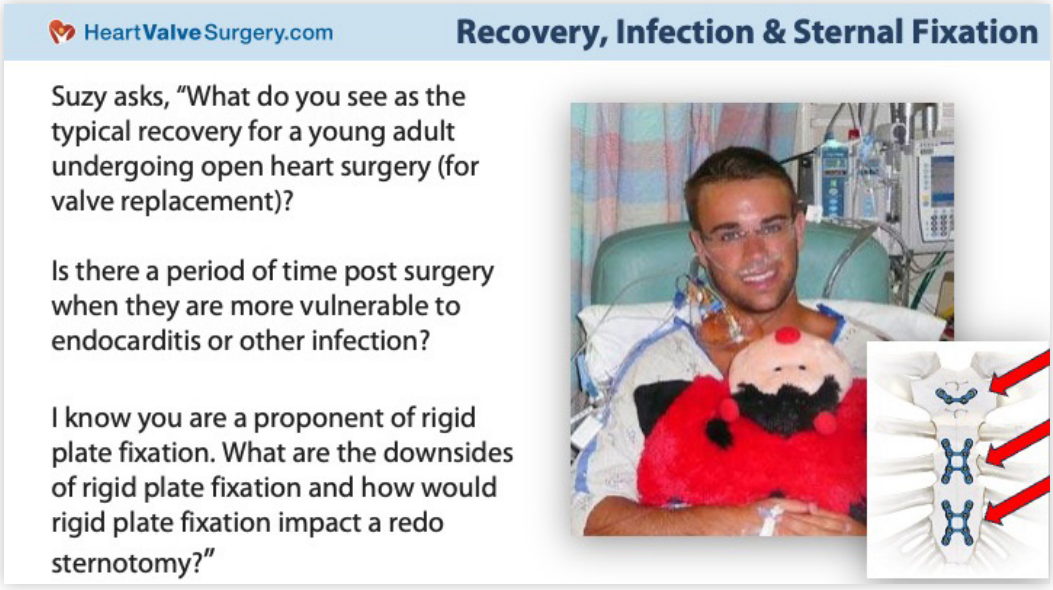
If that's not the case and I don't have room to do that, then we have to talk about moving over to a sternotomy. As you know, Adam, we've really approached that in as intellectual and savvy a way as we could so we could make that type of operation essentially the same as the minimally invasive. It's a spectrum of thought. It's a spectrum of procedure. It's a way of managing the entire experience for the patient. People have short-term goals and they have long-term goals, and we try to fit all of that in. I bring that to the conversation I think more than the patients do.

I think we should also recognize that when we put a – for example, a mechanical valve in – and you know I've done studies with the On-X valve. That valve doesn't change, so there's also that, that we don't have deterioration of that valve and it changes the conversation a little bit with respect what the demands and needs are of the space in the aortic root. The last thing I would mention is the same thing that we're doing for prediction in tissue valves in the aortic position, we're starting to do that in the mitral position too because that is part of the fabric of the discussion for mitral bioprosthetic valves too. Is there an option for a valve-in-valve later?

Adam Pick: I did not know that. We can probably talk about that for another hour.

Dr. Gerdisch: Yeah, unfortunately. Sorry.

# Patient Recovery, Infections & Rigid Sternal Fixation




Adam Pick: Let's get to actually something you were just talking about, this whole idea of recovery because Suzy's got a question. She says, "What do you see as the typical recovery for a young adult undergoing open heart surgery (for valve replacement)? Is there a period of time post-surgery when they are more vulnerable to endocarditis or other infection? I know you are a proponent of rigid plate fixation," which is the picture there on the right-hand side. "What are the downsides of rigid plate fixation, and how would rigid plate fixation impact a redo sternotomy?"

Dr. Gerdisch: Yeah, so really insightful question. This is a perfect example of how people think through the entirety of a process, and I really like that. The first one is a targeted one about infection. All of you all have probably heard me say, when we replace a valve, we're trading diseases. We're going to take away that really bad disease, and we're going to give you a minor disease, which is the new valve. That new valve, whether it's a tissue valve or a mechanical valve, has

vulnerability to endocarditis, which is why you have to take antibiotics when you go and have your teeth treated. That vulnerability probably is a little bit higher early after surgery, but that does not show up, actually, in the literature. It's probably because we're very cautious about how we manage people in those first few months.

Within a few months, there is some tissue overgrowth on the valve and probably has eliminated or made imperceptible that little bit of increased vulnerability, but any valve remains vulnerable for the entirety of your life. I would add, any abnormal native valve and, really, normal native valves have some vulnerability. If you have bicuspid aortic valve, or you have mitral gurgitation, myxomatous disease, or you have calcified valve, those valves are going to be a little more vulnerable to endocarditis infection. Take care of your teeth. Make sure that there's no opportunity for bacteria in your blood.

Rigid plate fixation, I think, if I had to pick one thing that changed the recovery experience for sternotomy patients in our practice to bring it quite near that of our minimally invasive patients, it is rigid fixation, which allows – we allow our patients to lift 30 pounds. They day after surgery, they can get up and down from their chair, up and out of bed, up and down from a toilet. We let them drive very soon after leaving the hospital. We allow them to go back to normal activity very quickly. I saw a few patients in follow up today, and all of them were pretty much back to their normal activity. That was less than a month after surgery.

I think rigid plate fixation has been a huge asset in our ability to expedite recovery both for young folk who want to – don't want to be out of commission for six or eight weeks. They want to get back to their lives. Also, when you think about frail or more aged people, they don't want to be disabled. They don't want to go to a nursing home for a week or three weeks. They don't want to go extended care because they want to go home, and so we've changed that trajectory as well. Everybody goes home. We have very, very low discharge to extended care facilities. If you're an older person, you can use your arms to get up and down, you're pretty well set to get your – all the things done you needed to do at home. Also, rigid fixation is probably the cornerstone element that allowed us to eliminate powerful narcotics for the vast majority of our patients, and that has resulted in less gastrointestinal issues, a brighter mind, faster recovery.

What's the downside? There's a question there, right? What's the downside? We don't have one, clearly. What's their impact on a redo sternotomy? I've been doing it long enough that I've had a couple of patients come back several years after an operation where maybe we're doing another valve or something, and we just take them out. You could even reuse the plates and put new screws in. That patient owns those plates.

The other question that comes up is, well, what about if you have to get back in fast? You got an emergency situation. You got to get back in fast. If you look at that diagram, those middle bars, the thin middle bars on those plates, we have cutters that in a second on each one of those we can clip those open and then the sternum is open. People have asked me have you had to do that? I've had to do it twice, and both of those people are alive and well. If it comes about that you have to reenter the chest emergently, it can be done. Like I said, we have been plating everybody for several years, so if we were going to experience a downside, I think we would've seen it by now.

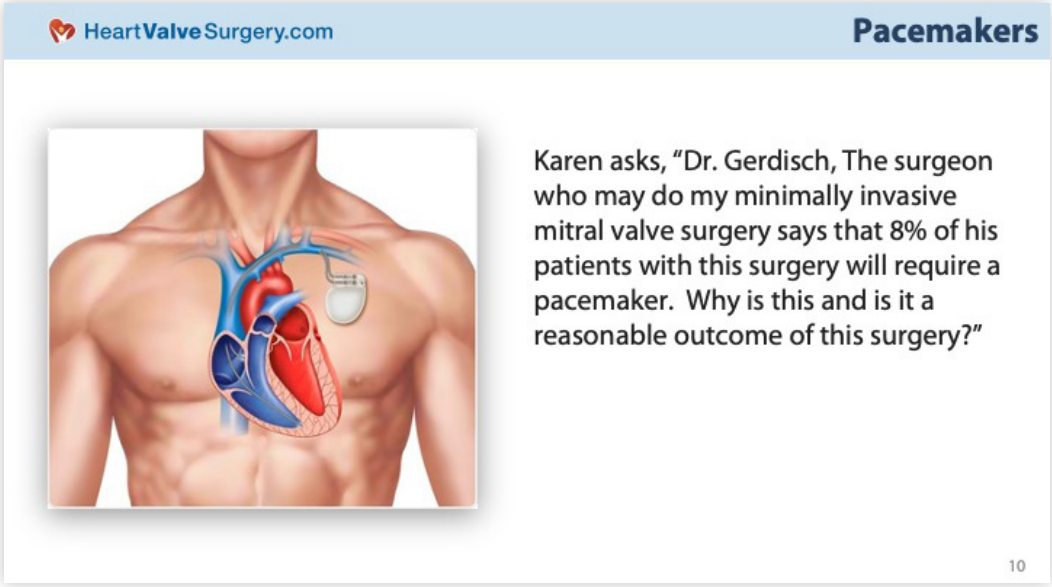

Adam Pick: Right. Dr. Gerdisch, somebody had asked you – we're going to go to this next slide, and we've got a couple of your patients here that have gone through – are going through this recovery process. You've discussed it was – at times, it was minimally invasive was just faster recovery and less narcotics, and you just mentioned how you've transitioned that now to sternal approaches. Are you seeing this convergence of, really, whether you have a minimally invasive or sternotomy, it's not a huge impact anymore for the patient because of your rapid recovery protocol?

Dr. Gerdisch: Yes. As you mentioned, Adam, we are really inspired by – when we mastered our techniques for nerve block for minimally invasive surgery and people are going home on Day 2 and 3 sometimes, we realize that we needed to be able to achieve similar goals for our patients with a sternotomy. This protocol that includes rigid sternal fixation, it includes increased mobility and manages the medications in a different fashion, and this is a great slide. On our far left is a fellow who did have a full sternotomy. He had an emergency or urgent surgery, went home two days after surgery. The middle picture where the gal is getting up and down and working out on a regular basis it looks like there, she's in her 80s. She's post-op Day 2. She goes home post-op Day 4, and she goes back to work three weeks after leaving the hospital. This is an older woman who would otherwise probably have to go to a rehab facility because she can't use her arms. She's using her arms, getting up and down, up and down out of her bed. She can go home and live alone and be happy again, up and down perfect.

Right hand corner, three weeks out from surgery, back in his exercise regimen, working out on his rowing machine, and he had a big operation. I replaced his aortic valve. His ascending aorta is first portion of his arch. The guy down there hitting the ball fast, three weeks out from the same operation. The fellow on the front right has not only run many races but within a few weeks of surgery was sending me videos of himself after a redo aortic valve surgery swinging his golf club. Quite honestly, I could give you – this doesn't end. I mean, I can just take pictures all the time. It's been an absolute game changer, and we're really thrilled that we can change that experience.

I want to go back to what I said earlier about taking time out of people's lives. When you talk about, for example, the young person there, if not only he has to undergo urgent surgery but then you disable him for a few months, it changes his perspective on his life, what his future's like, how he feels about his place in society and what he can do, but if you get him right back to it, then he can take care of himself and feel like he's still a dynamic person. Same thing for the older person that, again, they just don't want to be disabled. I can tell you that if there are older folks on this call right now, often the older person will say I don't want to do this if I'm going to be a burden. My goal for them is to not be a burden and for them to be happy with how their recovery is.

# Minimally-Invasive Surgery & Pacemakers



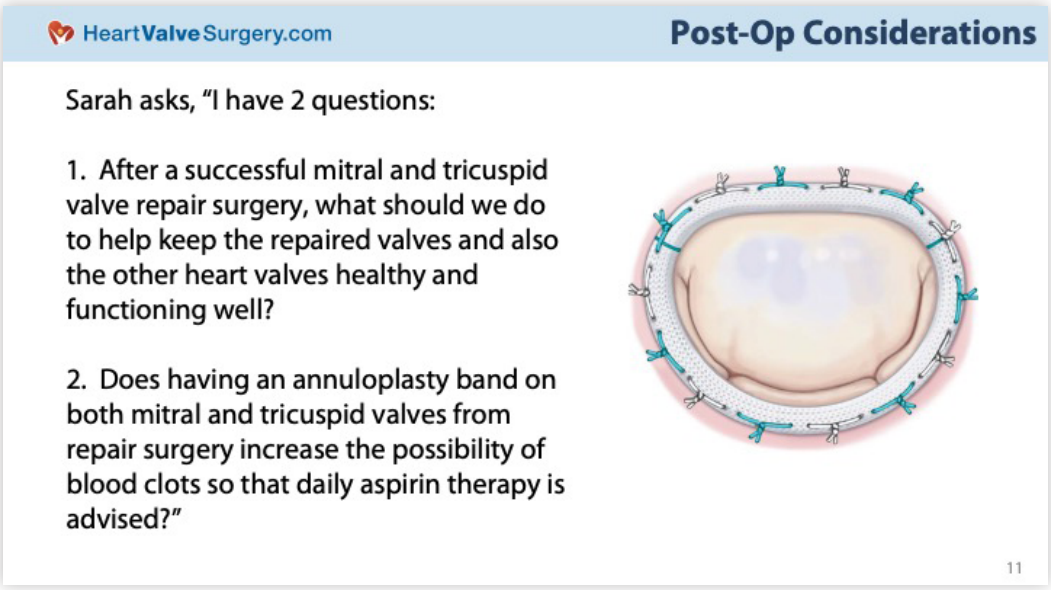

Adam Pick: Karen asks, "Dr. Gerdisch, the surgeon who may do my minimally invasive mitral valve surgery says that 8% of his patients with this surgery will require a pacemaker. Why is this and is it a reasonable outcome of this surgery?"

Dr. Gerdisch: I'm going to guess, honestly, that you heard him wrong, or her wrong. 8% would be really high for mitral valve. Mitral valve repair, in our practice, is very close to zero. As a matter of fact, I probably shouldn't keep talking about it, but it's been about 50 or 60 years since I've had somebody for mitral valve repair that needed a pacemaker. Mitral valve replacement hovers in around 4% and it's because we have to take these more of this tissue or you're typically taking calcium out and the tissue is inflamed and abnormal.

With a mitral valve replacement, it's about a 4% incidence of a pacemaker. It could even be a little bit higher for replacement for a given institute or a broader slot of people, particular pathologies. For mitral valve repair, it really should be

much lower than 8%. It's a good chance you misheard. Now, it could be specific to your anatomy or adding a tricuspid valve repair for some people will see an increase in the incidence of needing pacemakers, but specific to mitral valve repair, there would not be a usual number that would be high.

# Mitral Valve Repair Durability, Blood Clots & Baby Aspirin




Adam Pick: Moving over to another one of your specialties, Dr. Gerdisch, is about mitral valve repair. Sarah asks, "I have not one but two questions. After a successful mitral and tricuspid valve repair surgery, what should we do to help keep the repair valves and also the other heart valves healthy and functioning well. The second question is does having an annuloplasty band on both mitral and tricuspid valves from repair surgery increase the possibility of blood clots so that daily aspirin therapy is advised?"

Dr. Gerdisch: Great question. The interesting thing about valve disease, when we're talking about mitral and tricuspid valve surgery, it typically is genetic. It's typically an exogenous disease, but it could be rheumatic, which is due to having had rheumatic fever, which is a consequence of a strep infection that's not treated and you develop antibodies to your own valves or it could be some other inflammatory condition or autoimmune disorder or it could be folks who have metabolic disorders, like cardiometabolic syndrome and comorbid conditions. I think that when talking about valves more broadly, there are signals we can pick up from whatever our valve pathology is.

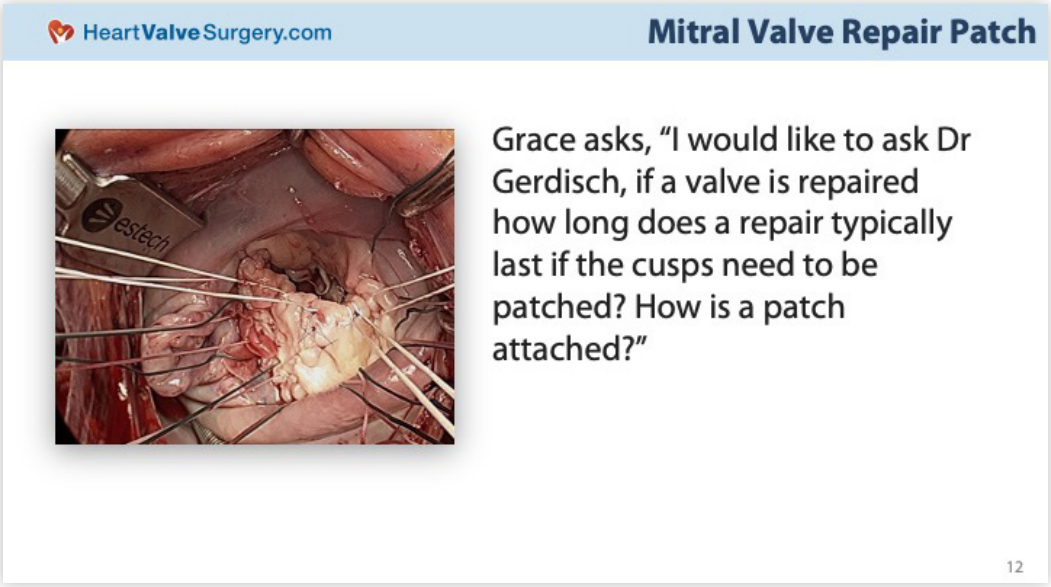
It goes all the way down to the level of before anyone needs something done to their valve. If we see mitral annular calcification, the valve is still working fine but there's mitral annular calcification, it's actually a signal of comorbid conditions. It's also, believe it or not, it's a signal of diminished longevity. If someone does an echo on me and I see I have mitral annular calcification, I'm interested in that from the standpoint of, why do I have it? Is it a signal of some other process in my body? Do I have ongoing inflammation? Do I have cardiometabolic syndrome? Am I diabetic? Am I managing – are there things that I can manage to fine tune my own physiology?

It's also true of aortic valve leaflets. The simple finding of sclerotic aortic valve leaflets signals an increased risk of coronary disease. That doesn't mean that you have it. It means that there's a little bit increased risk. If you have mitral annular calcification doesn't mean you have something else. It's a signal that you could. We have to look at it strategically from a standpoint of what's affecting the valve. Now, if we're talking about, for example, myxomatous mitral valve disease, which is a genetically derived pathology of the valve, and accompanying with myxomatous or secondary tricuspid insufficiency, when does are repaired, it's up to the valves to keep working, so how well is the valve reconstructed?

What are the stresses on the valves? What is the tissue like? There's nothing you can do about that. From a more overall perspective of how we unload valves and make sure that our valves are healthy, it really comes down to just really keeping ourselves healthy, so addressing whatever we can about our diets, our habits. Smoking is bad for everything. Some people love to smoke and they're not going to give it up, but it's bad for everything. Alcohol consumption in mild to moderation, not a big deal. You get into heavy alcohol consumption, it's bad for everything. Some of it is common sense.

Then the further you delve into it, the more aggressive you want to be about your global health, which will impact the health of your valves. That's a personal journey for people. I go on that journey with patients all the time. People shouldn't feel uncomfortable about that. They should feel like this is a time for me to grab hold of this. Does having annuloplasty band on both mitral and tricuspid valves from repair surgery increase possibility of blood clots and that you'll require daily aspirin? The answer is that general consensus is that people should be on a low dose aspirin, 81 milligram aspirin for the rest of their lives, unless they experience a bleeding complication. Yes, low dose aspirin is generally accepted for valve repairs to be a standard care unless there's a bleeding complication.

# Mitral Valve Repair & Patches




Adam Pick: Let's shift over to staying in the mitral realm but this came in from Grace. Dr. Gerdisch, I hope you're okay. They pulled this right from your operating room from some slides made for another presentation. She asked, "I'd like to ask Dr. Gerdisch if a valve is repaired, how long does a repair typically last if the cusps need to be patched? How is a patch attached?"

Dr. Gerdisch: Right, so that's really very specific question. I'm going to start more broadly which is that valve repairs in general, we see that up to about 15 years, about 85% of people never need anything else done again for the more standard repairs, the posterior leaflet repairs, the valve repairs that we consider straightforward. When we move into bileaflet repairs complex aortic, anterior leaflet repairs, that number drops probably closer to 75%, still a really good number, but it drops a little bit based on the complexity of the repair. A patch typically is related to a fairly complex repair unless it's just a discrete hole in the valve.

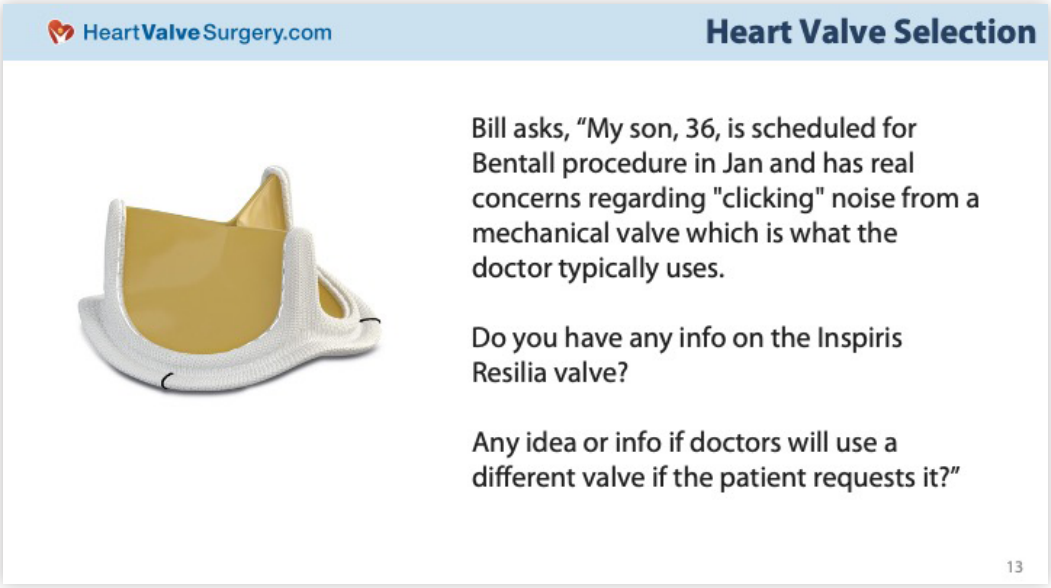
If that's the case, then the patch – and depending on where the patch is, the patch shouldn't affect the durability of the repair. Patches usually are made – folks will usually use pericardium when they do a repair of a leaflet or a patch. There are different types of pericardium that we use. There are different types of materials we'll use. Most of them overtime will get some calcium in them, but if you think of it as just a little patch in the body of the leaflet and the rest of the leaflet is moving okay, there's a very good chance that that patch isn't going to affect the performance of that valve.

In fact, I can remember a fellow that I did a homograft on. It was a redo homograft. He had been operated on by – I can't remember who it was, but it was somebody out of town a long time ago, a famous heart surgeon I just can't remember who it was. He had done a fabulous operation for him, but then he had reinfected his aortic root so I redid his aortic root. He had a patch on his anterior leaflet mitral valve. That valve was still working perfectly. It had been 20 years. A patch in and of itself doesn't diminish the longevity of the repair.

It sometimes is associated with a little bit more exotic repair. What you're looking at there is a very exotic repair that we're doing. We've reconstructed the entirety of the leaflet and we're putting a lot of cords in. Those repairs, we have to keep an eye on them a little bit more because it's just a big, a very big project, so actually, the right thing to do. Yeah, there'll be patches. There'll be things getting replaced in order to preserve the valve because we know that that's how we preserve people's valves.

Adam Pick: Yeah, and we're going to shift over to the aortic valve in a second, but Dr. Gerdisch, thanks to you and the education you've given our community about the benefits of the mitral valve durability and the return of patients to normal life expectancy after a successful mitral valve repair, I just want to share with you that I literally get emails from patients saying, "Adam, I am so happy I got a mitral valve repair. I was able to find a surgeon who was not going to replace the valve, even though I had been told by one or two surgeons that that was my only option." I want to thank you on your behalf because of those benefits of just taking the extra time to do the repair, using the techniques, the artistry is making a huge impact on people's lives. Thank you for that.

# Bentall Procedures, INSPIRIS RESILIA Valves & Patient Preferences




Adam Pick: Here's a question that came in from Bill. He says, "My son is scheduled for a Bentall procedure in January and has real concerns regarding clicking noise from a mechanical valve, which is what the doctor typically uses. Do you have any info on the Inspiris Resilia valve? Any idea, I love this question, any idea or info if doctors will use a different valve if the patient requests it?"

Dr. Gerdisch: Yeah, that's a good question, isn't it? At 36, requiring a – first of all, the first thing I would want to be certain of is that the 36-year-old actually needs a Bentall. In other words, can his aortic valve be spared? I still meet patients who have had their aortic valve taken out when it was an okay valve, but they had an aortic root aneurysm. Instead of only replacing the aortic root, the entire – the root of the aorta, in other words, the aorta itself only and not the valve, they've taken the valve, too. Even a bicuspid valve, if it's working well, or a trileaflet valve, it's working well, or if they can be repaired, those valves can be repaired, again, we're talking about keeping your own tissue, right?

This can become a very detailed conversation but at the end of the day, Goal Number 1, keep your own tissue if you can. There are exceptions to that, but keep your own tissue. We talked about that just a minute ago. First thing I want to know is does my son actually have a valve that has to come out. Then the question becomes what – if we're replacing it, what am I replacing it with. There are three reasonable options in a 36-year-old, if the valve cannot be repaired, three reasonable options. One is the mechanical valve, in which case, we typically implant the Onyx valve because we did a study and we showed we could run that valve at a lower those of blood thinner, decrease the bleeding events by 65% without increasing the thromboembolic risk and thereby providing a patient with a safer long-term outcome, we think.

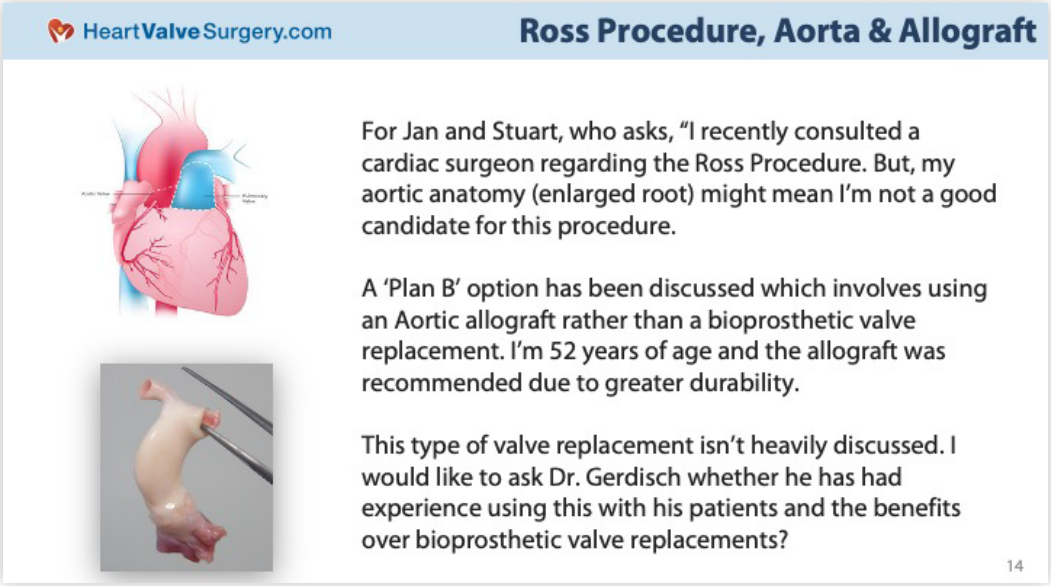
Tissue valve, yeah, the Inspiris is becoming a bit of a go-to valve. It's a very good valve. It has the advantage of a frame that is easily expanded when you want a valve in valve. It has been treated with Resilia. It's the latest thing in anti-calcification. Now, I come at this a little bit tangentially because I've spent my career keeping up with anti-calcification processes. They have all promised big and they've all delivered reasonably well. So far, this tissue process has delivered reasonably well. We'll see where it takes us in the long run. I do hope it turns out to be a really strong contender to diminish the wear and tear on a valve. The valve wear and tear is not just about anti-calcification. The leaflet durability, position, stiffness, a lot of things that go on with a valve.

A 36-year-old person getting any tissue valve is going to be in for a couple more operations. That might be just fine with that person. Certainly there are people who do that. If I'm 36 and I'm getting a tissue valve in aortic position, this is a reasonable choice. I want a big one. Please put a big valve in big, because the bigger it is, the longer it'll last. It's not just about big for the valve in valve. It's big for the durability. Because the way that pericardia valves fail is they stiffen, so the valve will be working fine, but as soon as it goes in, the clock starts sticking. The valves start to stiffen. If the valve is very big and it stiffens a moderate amount, then you don't see much from that, but if it's small and it stiffens a moderate amount, then you experience some symptoms from it.

Will the doctor use a different valve if the patient requests it? The answer is yes, of course. Doctors should always be able to use a different valve if a patient requests. I often tell my patients, if you change your mind rolling into the operating room, just tell somebody. I have them all on the shelf. I'll tell them what I have. If you change your mind, that's what we'll use. It's okay. Every patient is asked when we do legal before a surgery one more time, if I can't repair the valve, we're going to put in this.

The last thing we should mention, though, is the Ross procedure for a 36-year-old gentleman. It's an operation I don't do but I believe it has a place in the spectrum of our care. I think that whereas you could put three or four aortic valve repair and reconstruction surgeons in a room and we'll all argue about it. It's a darn good operation and certainly fits in the spectrum of what we're talking about here. I think, again, make sure that valve has to be replaced. Can it be repaired? If it's going to be replaced, those are your choices. I suspect this is not an emergency so pump the brakes a little bit. Make sure everybody knows what they're getting. You'll want to finish this and after surgery go, man, that's exactly what I wanted. That's what I would say on this.

# Ross Procedure, Aorta Anatomy & Allografts




Adam Pick: Yeah, I love the hierarchy of figuring out what is necessary, the value of the living tissue, and then exploring your options that are going to give you the best quality of life for you over the long term. You already hit on it, but we're going to dive a little deeper on it now, Dr. Gerdisch, which is the Ross procedure, something that I had nearly 18 years ago. I've never looked back, never had an intervention, never been on coumadin. I have scuba dived. I'm running, surfing, hiking without any issues.

Let's see what Jan and Stuart are asking here, Stuart in particular. Their questions were similar.

Stuart asks, "I recently consulted a cardiac surgeon regarding the Ross procedure, but my aortic anatomy, an enlarged root, might mean I'm not a good candidate for this procedure. A plan B option has been discussed, which involves using aortic allograft rather than a bioprosthetic valve replacement. I'm 52 and the allograft was recommended because of greater durability. This type of valve replacement isn't heavily discussed, and I've got to agree with him. I would like to ask Dr. Gerdisch whether he has had experience with this with his patients and what are the benefits over bioprosthetic valve replacements?

Dr. Gerdisch: These are such insightful questions. First of all, the point is made that the Ross procedure might not work well because of the enlarged root. Again, if that root is enlarged and if the valve is actually leaking and not blocked, it might be a case where you would fix the patient's own native valve and then replace the architecture around it. It is true that the Ross is a little more vulnerable to failure eventually in very enlarged roots, but there has been more success of recent because of different types of reinforcement that the surgeons who do the Ross are using so that still comes into the conversation.

Can the valve be saved? Is it true that the Ross isn't a good option? Then the question becomes use of the homograft. I use homograft but I use them almost exclusively for people who have endocarditis, for example, I just had a case recently of a gal who had her aortic valve replaced several years ago with bioprosthetic aortic valve. That became infected. She had an abscess there in her heart now. We needed to take all of that out, including the abscess, and

rebuild on top of the heart. This is the conduit for that. The homograft is the perfect answer. I actually just saw her in the office. It's the perfect conduit for that because you could fill spaces in where the heart's been destroyed.

That is the one, actually only, well, we might say street tested version of use of a homograft where there's a clear advantage, endocarditis with an abscess. Endocarditis by itself may not be true there. There are studies that show you can use whatever valve you want and it doesn't make that much difference, but an endocarditis with an abscess, which you don't have here so don't worry about it. Homograft is a primary choice right out of the gate. That's a little bit controversial. I'll tell you why.

I think it was in 2018, Dr. Yacoub who I think still is the holder of the award – he holds the place of the heart surgeon that's done the most heart surgeries in an entire career in England, did a lot of homograft surgeries, did a lot of aortic root surgeries. He actually developed the modification of aortic root replacement. My point here, though, is they did a randomized study. I think it was 160 patients if I'm not mistaken. They randomized half of them to a homograft, half of them to a free style root, that's a type of bioprosthetic root because they had to replace the root. Free style root is actually the entire root of a pig.

My point in telling you this is that the outcomes were the same. If we compare it now to valves depending on the size of the valve and what the long-term game is and then we add in the challenge of a redo homograft, because they're hard to do, no matter who you are. I've done a lot of them. Taking a homograft out and redoing it is a lot of work. Sometimes we'll just open above the homograft and replace the valve through the homograft, but sometimes we have to take

the whole thing out. The reason it's a lot of work is because that wall that you see on the homograft at the bottom picture there, that aortic wall, it will calcify. It will calcify before the leaflets of the valve do.

That wall will become calcified and it will get stuck to everything around it. That doesn't cause you a problem until somebody has to go in there again. You can't just open through that calcification and work on the valve and go back out. You either have to go in above the homograft in the native aorta or you have to take the homograft out. Reoperation for the homograft is a coronary operation coming out the gates. It wouldn't be my first choice. If you have to have a Bentall, you're 52, your choices are, again, we talked about the Ross.

Is there a possibility the valve can be repaired? Then a Bentall, in my mind, either a Bentall with a big standard valve in it or a – Bentall meaning the aorta with the valve implanted already in it, the aortic root with the valve already in it, or a Bentall with a mechanical valve. You take your coumadin and probably not have anything done again. At 52, those are good options. Mechanical valve is still a perfectly good option in a 52-year-old person.

Adam Pick: Dr. Gerdisch, real quick, I'm going to ask for a sentence in this and then we're going to the next question. This comes in live from Eddy, "How long does a bovine valve last?"

Dr. Gerdisch: It depends on the human being and the size of the valve. I talked about earlier the way they fail is they stiffen. They get calcified and they stiffen. If I'm a little person with a big valve, I get more mileage out of it because as the valve tightens, the hole becomes less – it's less consequential for me because I'm small. There's that. The size of the person, the size of the valve, then there's

the age of the person is the Number 1 mechanism or the Number 1 thing that expedites demise of the valve. The younger you are when you get a tissue valve, the shorter they last. Nobody can argue with that. They don't all last the same for anybody. If you're younger, it doesn't last as long.

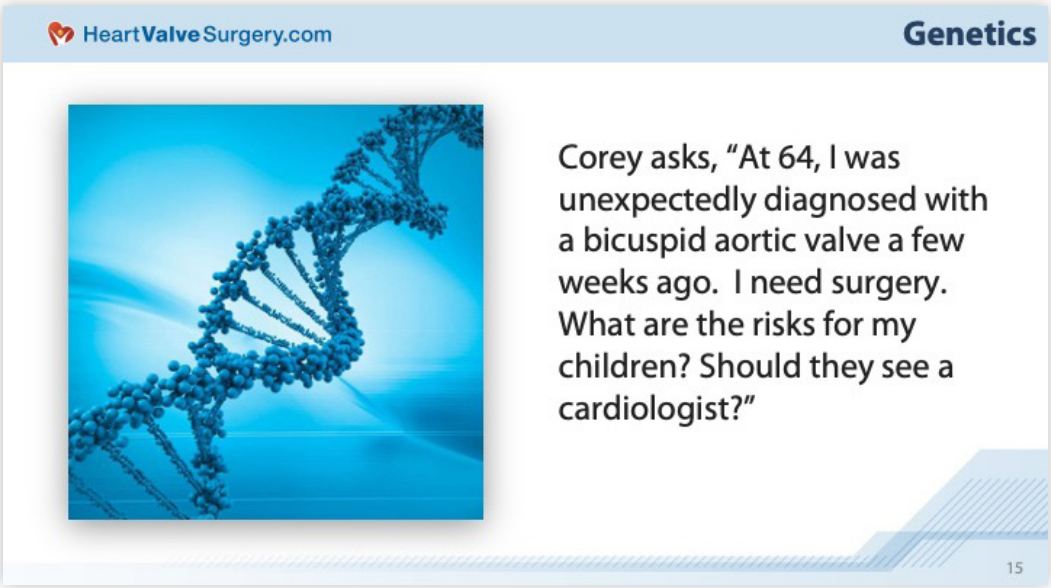
The next thing is that we see a pretty clear correlation with is cardiometabolic syndrome. Cardiometabolic syndrome is a combination of hypertension, diabetes, obesity, and inflammatory markers. The last one is probably the most important because increased inflammation in the body probably expedites the demise of the valve. Those are the things you have to thing about if you're going to think about everything.

Adam Pick: I'm sure patients are wondering on the line, "What's the fastest that somebody's come back to you as a younger patient and their tissue valve has deteriorated?"

Dr. Gerdisch: There was a valve that I don't think is in the market anymore. It's called the MitraFlow. I never put any of them in, but there were surgeons around who did put a lot of them in. Those valves failed really fast and we were taking them out of people sometimes a year or two after they had them in. There's another valve that I think has waned in popularity. It has a similar fabrication that still is a decent valve but it has a shorter shelf life – or shorter life inside people. I think that now that things have settled down and we have a major contender in the bovine pericardium and a major, really a major contender also in the porcine leaflet, both of those valves are really doing really well now.

I don’t think we have to worry about rapid turnaround due to device failure so much as just whether it could be expedited by the milia of the patient. In that, I have some examples of folks actually that I use I talks where I have had patients that are showing up, again, they show up from all over the place, but that have shown up within four or five years of having their valve replaced and not need another valve replacement.

# Genetics




Adam Pick: Corey asks, "At 64, I was unexpectedly diagnosed with a bicuspid aortic valve a few weeks ago. I need surgery. What are the risks for my children? Should they see a cardiologist?"

Dr. Gerdisch: I'm so glad you asked this, Corey, because I talk to people about this all the time. Sometimes I forget and I want everybody to recognize that bicuspid aortic valve pathology, disease, whatever you want to call it, variant is super common. Looking at 1.5% of the people on the planet, maybe even 2%, so chances are we all know somebody with a bicuspid valve, Number 1. Number 2, not everybody with a bicuspid valve needs something done to it. There are people who live their whole lives with bicuspid valves. Sometimes I'll even see somebody who's 85 years old who now has aortic stenosis, and believe it or not, it was a bicuspid valve their whole life.

Number 3, if you have a bicuspid valve, there's about a 10% chance that one of your first-degree relatives do, brothers, sisters, kids, parents. If one of them does, there's about a 25% chance that another one does. The other thing I would point out that a lot of people don't know, including a lot of surgeons, that if someone has a bicuspid aortic valve, there is somewhere between a 10% and 30% chance that a family member has aortopathy. They could still have a normal aortic valve, but they could have abnormal aorta. For all those reasons, if you have a bicuspid aortic valve, the first-degree relative should all be interrogated, at a minimum, I think, at some point with an echocardiogram.

Someone might say, "Well, they listened to me. They didn't hear anything." Unfortunately, doctors aren't all that great at hearing things. If the valve is not problematic right now, the flow may be not turbulent enough to create a murmur. An echocardiogram I think is an appropriate precaution for anybody that's a first-degree relative to somebody who has a bicuspid valve.

Adam Pick: I think we've got to flip the switch and ask mitral valve disease. Do we know about the genetics there? Is that an unknown? Is there some connection?

Dr. Gerdisch: Yeah, it doesn't have the direct link that the heritable characteristics of a bicuspid valve. Aortic valve do. We know it is a genetic condition. First of all, there's multiple variants. It's sporadic. In other words, it just can happen as one of the mutations in you. There is some heritable component to it, but it's not as strong. I know this because I have patients whose families I've operated on. I've operated on their mom. I've operated on their daughter that they've had the same condition as someone with mitral valve disease. We know that there's some thread but it's not a rope like it is with bicuspid valve disease.

# Mitral Valve Calcifcation and Treatment

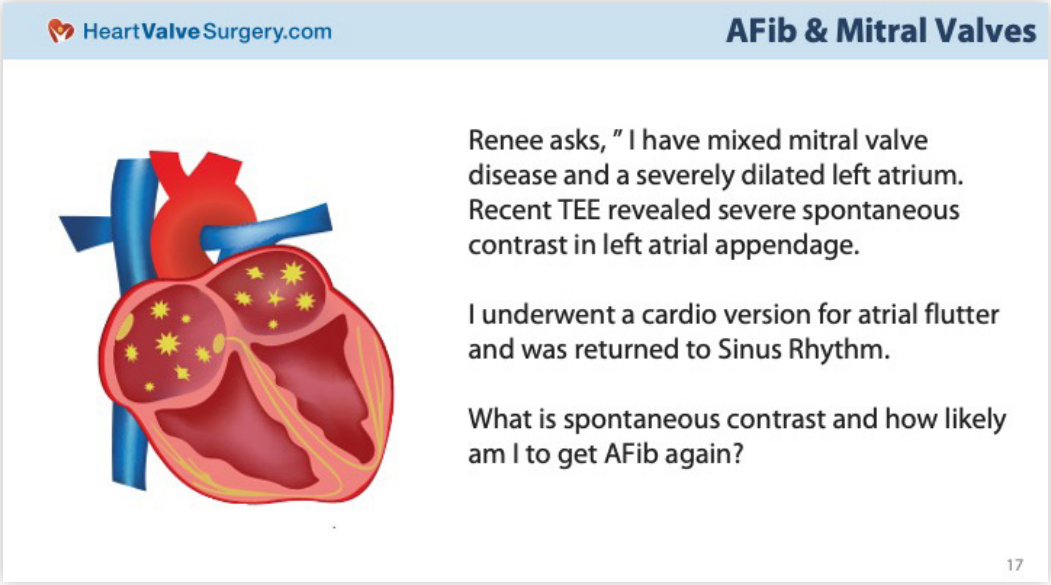

Adam Pick: We're going to stick with mitral valve disease with Brett. I also took these pictures from your operation room, Dr. Gerdisch. "What can you tell me about the causes of mitral calcification and its treatment?"

Dr. Gerdisch: We touched on this earlier. This is a super interesting pathology for a couple of different reasons. One of them is that we're seeing more of it. I don't know if we're seeing more of it because people are aging into it more or if it's more, and I believe, and I've talked to this recently about somebody smarter than me that that may or may not be true, but I think it could have some roots in our metabolic state and the level of inflammation in our body and cardiometabolic disorders and our calcified tissue. That said, that calcium can be there as a consequence of some direct inflammation of the valve. For example, in rheumatic valve disease, we will see calcium, but it's not like that you see right there usually. That is big calcium in the wall of the heart.

In rheumatic disease, often we'll see the calcium in the leaflets and then maybe some in the annulus of the wall of the heart. Then other folks we're going to see this kind of robust calcification in the annulus that's in the wall of the heart. The mechanism for that, quite honestly, has not been fully elucidated. It definitely has a relationship to age. You could be perfectly healthy and if you happen to make it to be 85, you may have a lot of calcium in the annulus of your mitral valve or we won't be able to tell you why. That's probably a genetically derived mechanism of something that infects in those people. It doesn't really hurt them because their valve is still working and they've got calcium in the annulus.

When it starts to encroach on the valve and encroach on the space of the valve, that's when it becomes a pathology and that's when it becomes a problem because of the mitral stenosis. That's when you have – or it can be part of a leaking valve. That's when we have to take it out. Causes, you see it's a shifting profile. Treatment, you don't do anything for it other than take good care of yourself and ensure you're in good health, other than surgically. When we have to approach it surgically, sometimes we have to extirpate it like we are here. Sometimes we have to work around it. It's challenging anatomy in the mitral valve and we have to deal with it, but we do. Sometimes we take it out. Sometimes we work around it. It's just a matter of where the position is and whether it's encroaching into the space of the mitral valve.

# Atrial Fibrillation & Mitral Valve Disease




Adam Pick: We're going to switch now, Dr. Gerdisch, to something that you and I have talked about a lot. It's undertreated, unfortunately. It can cause clots. It can cause stroke. It's AFib, atrial fibrillation. Renee says, "I have a mixed mitral valve disease and severely dilated left atrium. Recent TEE revealed severe spontaneous contrast in left atrial appendage. I underwent a cardio version for atrial flutter and was returned to sinus rhythm. What is spontaneous contrast and how likely am I to get AFib again?"

Dr. Gerdisch:  Wow, so spontaneous contrast is another way of saying that you have blood that's not moving well. When the blood stagnates, it swirls a little bit in that space, it's not moving through the atrium, you can see that on the echocardiogram. That's spontaneous contrast. It's an ability to visualize something you normally can't see. How likely are you to get AFib again? I'm going to say that you are very likely to get AFib again. The reason I'm going to say that is because you have a severely dilated left atrium. You've already had a cardio version. You have mitral valve disease. You see that image there shows the sparks and stars. Atrial fibrillation is portrayed that way, but atrial fibrillation is related to what you had, which is flutter.

Think of it this way, as the atrium gets big and the tissue changes, as the tissue changes, the pathways in the atria change. The electrical conduction changes. If you get stuck in a particular loop, there's one loop of atrial conduction in the atrium that fires over and over and over again, that's flutter. Now if I have flutter and I add another one, once I've got two of them, it looks like fibrillation. I add three, I could add four, five, six, seven, eight, that's what fibrillation looks like.

Now, there are other smaller versions of that that contribute to atrial fibrillation, etc., but flutter and fibrillation, especially when the left atrium is big and if that flutter, especially if that flutter is on the left side, then that could be problematic and it's going to be a substantial likelihood that you'll go back into atrial fibrillation at some point. There's medications they can use. There are abrasions they can use, but if your left atrium is severely dilated, the abrasions typically don't work out real well [0:53:28] can do through your leg. I guess what I'm looking at here is, though, is a mixed mitral valve disease, maybe we should fix the mixed mitral valve disease.

I don't know how bad that is, but why is your atrium so big? An enlarged left atrium in and of itself is a risk. An enlarged left atrium is predictive of a shorter life and a risk of stroke. It doesn't mean you're going to have those things, but if we look at 1,000 people and the people who have the big left atria, they're a higher risk population. I want to know why is my atrium big, what are my comorbid conditions that contribute to that, hypertension, sleep apnea, those are important. Then is my mixed mitral valve disease worthy of treating? If it is, then the mitral valve gets fixed or replaced or whatever needs to be done. Then the AFib gets fixed, too, with a Maze procedure, the most definitive procedure we have to treat the irregular rhythm.

# Surgeon Selection


Adam Pick: Dr. Gerdisch, you're talking about a lot of different cardiac disorders that need to be fixed in hopefully, potentially, one procedure, if it gets to that point, which leads to a question that's come in from Martin Olsen. We had a follow-up tied into – I'm just going to jump to it. It's this question from Joey who asked a really important question, whether you've got an isolated valve repair or a valve replacement or you need some aneurysm work. "Where do I find surgeons track record and performance?" Joey is asking specific about mitral valve repairs. Maybe we can talk about that first. I'm just if you were a patient or

if your mom needed surgery, how do you get that information?

Dr. Gerdisch: Right, so some of this is elusive. Let me tell you why. First thing that we look for is some volume. We want some kind of volume threshold that the surgeon does a fair amount of mitral valve surgery. One of the things that we recognize when we look at the entire nation is that the average heart surgeon only does several mitral valve operations a year. That may or may not be okay, depending on what that pathology is and what it's combined with. Do you need coronary bypass? Do the valves definitely need to be replaced? A replacement is easier than a repair in general. Volume clearly drives some level of expertise.

That said, there are going to be some surgeons that they don't have a super high volume, but they're superb mitral valve surgeons. We don't want to deny those surgeons their opportunity to take care of the patient and do a great job. Some of that is going to be direct interaction with the surgeon. How often do you do this? Tell me what your outcomes are like. One of the things that has been really hard for us to fully pin down is how often are valves that can be repaired getting replaced. When we talk about leaking valves, you can have a leaking valve that's leaking because the patient has poor [0:56:40] and it's a really sick heart. The valve is leaking because the valve is tethered or maybe it has calcium in it, too, and the valve is a leaking valve but it's not supposed to be repaired. It's supposed to be replaced.

Then you have someone else who has degenerative disease in the mitral valve where, for those of us who do a lot of repair, we're very close to 100% repair rate for those valves. We don't want these people to get their valve replaced necessarily. It's hard to pin that down, though, because we still have what we can extract from the ACS database about whether the valve is leaking or the baseline pathology was, but we aren't there with our eyes on the valve. It's volume. It's to some degree, of course, reputation, outcomes, known outcomes. Then the personal relationship with the physician is established whether the

physician feels comfortable they can repair the valve. Doctor, do you feel comfortable that you can repair this valve?

As you know, Adam, I have a conversation about minimally invasive versus sternotomy and it depends on the anatomy and if there's calcium and all the different things that we have to consider. You can't open the book on this. You can't just find it on the internet. You use the resources that are at your command, obviously. What are published are STS numbers, for example, for mortality, morbidity, we get star ratings for things. They tell about half of the story. If somebody has a really good poor rating, chances are that means something. Medium I don't think it really makes a great deal of difference because there's this mix of patients and a lot of things that go through the process.

I don't like to say, oh, no, you can't do mitral valve repair because you don't do enough mitral valve repairs. I like to say, do you feel like you have the equipment intellectual skill at your disposal with your team to be able to create an environment where you can safely repair a valve? Then that's what should be happening there. I had a surgeon in my operating room yesterday watching me do a mitral valve repair, a young guy. Let me tell you. That guy is a great surgeon and he's going to be a stellar surgeon. He's going to be somebody – I'm going to watch this guy. He's at one of our greater hospitals Loyola right now, and it was clear that he had the intellectual commitment, the aspiration, and the safety in mind to be successful. All of those things derived this whole process. I wish I could tell you just where to go right off the cuff, but you got to do the homework. [0:59:17] mitral valve. It's true for all valve surgery. As we get into complex aortic surgery – and it depends on what part of the aorta. As

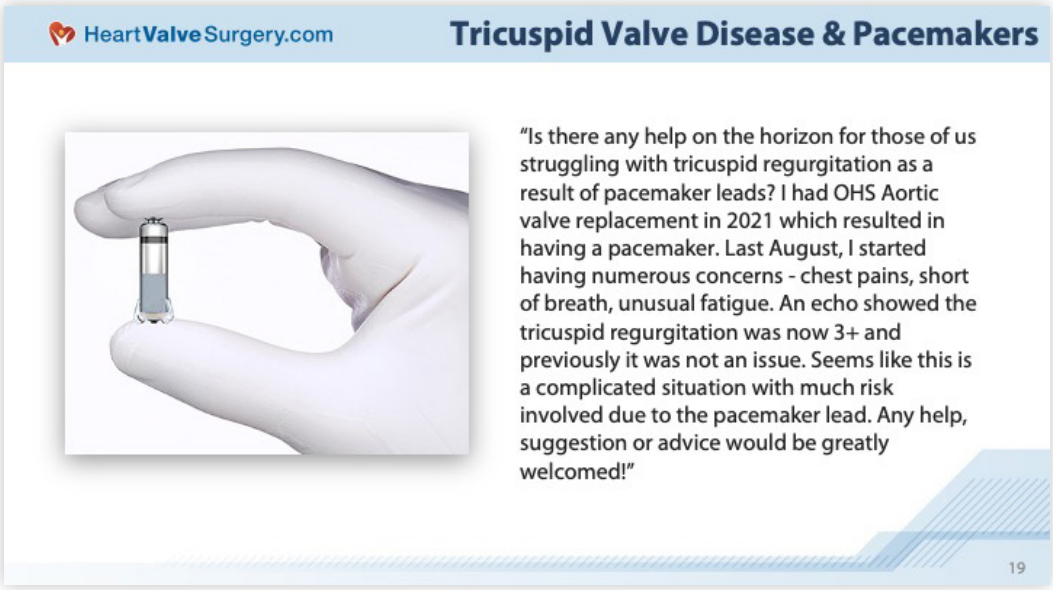
you migrate into larger scale aortic operations, that really refines you down to particular centers in some cases that really do these exotic, more aggressive repairs.

I know you know Dr. Eric Roselli. Eric is a master of the entire aorta, so it's a different animal than – I can certainly do the aortic root and the arch as well as anybody but when it comes into these more exotic repairs traveling into the rest of the chest, you're going to see some aortic error. It's a refined – there's finesse; there's nuance to this process. I think that because mitral valve surgery usually isn't an emergency, patients can take their time and sort it out. There are nuances to what the surgeon might offer.

We've been talking about saving valves. We're doing – presently doing some new techniques in patching valves that, admittedly, is avante guard. We present it to the patient in that fashion so that they can understand what those things are that we're trying to explore on behalf of the patients and on behalf of what we can do in the future. I know that's a long answer, but it's such an exciting question. How do we figure it out? How do we make sure that people get to the right people?

Adam Pick: Well, I think – I get this question, Dr. Gerdisch. For everybody on the line – I get the questions probably about four or five times a week. How do I know who's good and who isn't? You just – for me what I find is you – just like Dr. Gerdisch said, you have to ask the questions. You have to get comfortable. You have to look for that connection. If you need to, maybe you ask for patient references if they'll give them to you.

# Tricuspid Valve Disease & Pacemakers




Adam Pick: This question is from Judy who asks, "Is there any help on the horizon for those of us struggling with tricuspid regurgitation as a result of pacemaker leads? I had OHS Aortic valve replacement in 2021 which resulted in having a pacemaker. Last August, I started having numerous concerns - chest pains, short of breath, unusual fatigue. An echo showed the tricuspid regurgitation was now 3+ and previously it was not an issue. Seems like this is a complicated situation with much risk involved due to the pacemaker lead. Any help, suggestion or advice would be greatly welcomed!"

Dr. Gerdisch: There's so much exciting stuff going on in heart surgery and in heart therapy This is another really interesting subject. First of all, the answer's yes, if the valve is leaking because of the pacemaker, sometimes you take a lead out, it gets better. Sometimes you have to do it surgically, take the lead out, repair the valve. Sometimes you have to replace the valve. There's always something you can do, so we do treat that. It's not that infrequent because so many people with pacemakers.

The other thing is now, they have pacemakers that are just insanely cool. This is a pacemaker. It's the size of a vitamin. You go through the patient's vein, the elecrtophysiologist does, and puts is down inside the heart. There's no wire coming out through the tricuspid valve  now. So no penning of the valve, no battery on your chest, no pacing where it's going through the veins. They have versions that will sense the atrium, so you can just put one in the ventricle of the sensiatrium and pace accordingly. Now they're working on a version where you have one in each chamber. The threat of those pacing wire – although, keep in mind, pacemakers are a good things. I mean, they have saved so many lives, changed the lives of so many people over several decades. We have to always remember that all this stuff starts somewhere. The fact that they're innovating to this new level, we may see less of those complications.

In folks that have needed pacemakers, we've been looking at those opportunities to use that advanced technology. I think it's going to revolutionize the consequences of the pacemakers. To answer that question briefly, which I can never do, if someone has a lead that's causing a problem and the valve is leaking severely, as soon as there's any evidence of compromise, that probably should be addressed, because you don't want to end up in right heart failure.


Adam Pick: Well, Dr. Gerdisch, on that note, I want to thank you. I want to thank all the folks in the community for being on the line. If you not hang up just yet because I'm going to ask you to complete that survey. This really is an extraordinary situation. We've never done this before and to have so many people come together with these great questions, it seems like probably doing another one of these is not just a good but a great idea. Dr. Gerdisch, thanks for everything you have done in your career and brought this incredibly research and clinical experience to our webinar today and sharing all these great things. As we wrap up today, I just want to go ahead and thank you, everybody on the line, for the survey that's going to be popping up on your browser here in a second. Again, thank you so much for everybody being on the call and Dr. Gerdisch, thanks so much for being here today.

Dr. Gerdisch: Thank you. Thanks, everybody, for getting on and thanks for the great questions. I wish we could've answered them all. I imagine that we will.

## HeartValveSurgery.com Resources for Patients

Since 2006, HeartValveSurgery.com has developed several resources to help you better understand your diagnosis, your treatment options and your recovery.

Listed below, please find resources created exclusively for patients and caregivers. We hope they educate and empower you.

- Adam's Free Patient eBooks - Download 10+ free eBooks about heart valve disease and treatment options for aortic, mitral, pulmonary and tricuspid valves.
- Heart Valve Learning Center - Visit the Heart Valve Learning Center to access over 1,000 pages of educational information about valvular disorders.
- Patient Community - Meet people just like you in our patient community. There's nothing better than connecting and learning from patients who are sharing their stories in our community.
- Surgeon Finder - Find and research patient-recommended heart surgeons that specialize in heart valve repair and heart valve replacement procedures.
- Heart Hospitals - Learn about medical centers that have dedicated teams and resources that specialize in heart valve therapy.
- Adam's Heart Valve Blog - Get the latest medical news and patient updates from our award-winning blog.
- Educational Videos - Watch over 100 educational videos filmed by the Heart-ValveSurgery.com film crew about heart valve surgery.