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Hello. Thank you for joining us. My name is Vince Park. I'm here with Brij Maini. And we're here to present to you thoracic and abdominal aortic stent graft procedures. Brij.

Good evening, and thank you for joining us today. I've been working with Vince for the last five years, and we with each passing year I see the technology evolve to a completely different level. So we thought we would bring the operating room to you today. It's almost like bringing your daughter to work even though we didn't bring our daughters to work. Vince didn't have a daughter, but I have one, and she's not here, but none the less. We're going to show you two cases, as Vince has said, and we hope you like them and it's going to be you guys spending a day with us, and enjoy. We're going to show you an animation courtesy, Medtronic Incorporated. And let's show the animation footage.

So stent grafting is a procedure that has been around for almost two decades now, and basically these are surgeries done minimally invasively without cutting open the chest or the abdominal cavity and implanting these stent grafts in a very easy fashion so as to achieve the purpose of presenting aortic aneurysm rupture. As long as the aneurysm does not rupture there really is no need to fix it. And if we knew for sure that the aneurysm was not going to rupture in you there would be no reason to fix it. But since we do know if that is going to happen with you, we have to go ahead and fix it.

And Vince what do you think from a surgical perspective from the times when open surgery was the gold standard, and in my ways it still is for certain conditions, the difference that you've seen as we've gone over from open repair to stent graft repair?

It's a very big difference, Brij, a very big difference. The standard way of fixing these aneurysms used to be having to cut open either the chest or the belly, and basically moving all the bowels out of the way, getting down to the artery, the aneurysm, cutting it out and replacing it with a plastic tube much like the way plumbers would replace broken pipes in a house. Patients would have a lot of problems afterwards -- pain, disability, suffering, infections, big incisions.

But as you will be able to demonstrate to us with the stent procedures, they go home the next day, a couple cuts in the groin, and they have very little pain, very little disabilities after the surgery. In fact, a lot of them can't tell they had anything done to them.

Yeah, exactly. We've seen that phenomenon success in our patients who have done extremely well, and it's almost amazing. And a couple patients that have come in have told me after they came back for their month follow up and told me, “Is that it? Is there something that you are not telling us, you know, or do we need to do something extra after this?” And the answer, obviously, is, “No.”
What you can see on the animation here is some numbers. And as you just saw that if the aneurysm is greater than eight centimeters the risk of rupture is more than 50%. Obviously, if the an aneurysm is less than four centimeters, there is no reason to go ahead and fix it, either with open repair or with stent graft repair, and there are certain guidelines that we follow in medicine that allows us to go ahead and repair these aneurysm.

And, as you can see in this animation, a lot of people have asked us as to how do you get blood to flow from a tube to go down both of the legs? And what I tell them, as you can see in the animation, is that the abdominal aortic stent graft is like a pair of trousers with one leg cut off, and you go ahead, deploy the trouser with one leg into one limb, and then you cannulate the other side and then go ahead and implant the iliac extension or the extension on the other side, as you can see in the animation right now, and it works phenomenally well.

And as we will go over the cases that we are going to show you today, this has become the standard of care, and we are going to go ahead and show you first the abdominal aortic aneurysm repair, followed by a conduit construction, and then a thoracic aneurysm repair, and enjoy.

We’re going to have some footage here of our OR cases. You can see here the operating room. Dr. Maini is to be right of the patient just to the right of the camera. We make an incision in the groin. It’s about two to three-inches long. Basically we’re cutting down into the groin, getting down to the artery. And you can see Dr. Maini placing a needle and some wires into the artery in the groin. These wires will go up to where the aneurysm is and will guide his stent exactly where he wants it positioned.

Now this is in contrast to where we were talking about the open procedure before. Look how long that incision is. It’s about two to three inches long. To do the standard, the old fashioned way, basically you would have to cut the entire belly open. And if you can imagine any kind of incision in the belly, it’s a lot of distress to patients both physically and mentally afterwards.

And there are some instances where, in very, very select patients, you don’t even need to do a cut down, but for all intents and purposes the standard of care is a cut down. And what you can see here is a catheter. It’s called a “pigtail” because it’s got a pigtail at the end, and the markers that you’re seeing are radio opaque that you can see with an X-ray machine, and that’s what we use to make measurements as to see how long the stent graft is supposed to be. Even though we have already done those measurements with a CT angiogram, which is the way all measurements are done these days. And CT angiograms have become the standard as to how you measure and size these stent grafts. They all have to be sized before the procedure or the initiation of procedure because everybody’s aneurysms are different from other people’s aneurysms and sizes.

What you can see here is that we are snaking a wire through the initial catheter that had done gone on into the common femoral or the groin artery, and you see the hands moving pretty rapidly. And there’s a lot of technique and a lot of experience that goes into putting these wires and catheters up in a very skillful fashion. It is very easy to hurt the diseased vessels and/or cause a huge problem on the operating table.

What we’re going to show you right now is a lot of times your doctors may have asked you or might ask you in the future is that we will have to go up and close off a blood vessel before we can put it in a stent graft. And the rationale for that is that when you put in a stent graft there will be backfilling of blood into the stented area, which will result in repressurization or the aortic or the aneurysm sac, which kinds of defeats the purpose of putting the graft in to begin with; and therefore, you go in and close those vessels that you know are going to be a problem.
And this is a similar case we are showing you where you go in from the left side and you close off the internal iliac, which is the branch just coming off to the center of the screen, and the catheter is pointing towards that side, and what we will do is we made this road map so we don’t have to keep injecting die into the patient. And we will now snake a wire, what you saw just now. We’ll be putting a wire in on the outside, now this is on the inside of the patient, and with these X-ray images guide ourselves into the internal iliac artery.

And as you can see, the wire is being snaked in, and you have to skillfully maneuver the wire into one of the branches where you see the wire is going to be safe and not hurt the patient or perforate the blood vessel, and then go ahead and advance the initial sheath into the internal iliac and go ahead and proceed with the embolization process. And as you can see, the sheath is being advanced right now into a safe position so it does not recoil or prolapse back into the main vessel, because you certainly do not want to put in the embolization material into the main blood vessel.

Now this is a device that’s called an Amplatzer vascular plug. It’s made of nickel and titanium. It’s a mesh, and it’s attached to a wire or delivery cable with a screw, which I’m pointing to right now. So the theory behind this is that you can put this back into a tube and push it out. So the moment you push it out, it takes the same shape and format as it was designed to begin with. And now we insert this into the catheter, which is sitting in the blood vessel that we want to close off and go ahead and implant it.

Now, Vince, what do you think, from a surgical perspective, if this was an open repair and you had to isolate the internal iliac, surgically how much more difficult that procedure would be.

Right. The fluoroscopic view here is very deceptive because here you can see everything, all of the arteries, all of the flow to the different branches. In an open procedure you don’t have the luxury of this X-ray machine to show you everything. This is like having X-ray eyes like superman. You can see everywhere that you want to go where you need to go. When you have open procedure, you have bowel, you see those big fluffy things like clouds. You have bowel in the way. Oftentimes patients are deep in the groin. Their pelvic bones produce like a deep hollow, and you’re trying to work down there to fix these very small arteries. Sometimes they’re very thin, and it’s very difficult to manipulate instruments down there and do what you need to.

So what we’re showing here is, as I was saying, the cable is connected to the Amplatzer device with a screw, and all you need to do is unwind the screw, as we just did, with a hemostat, and the device is in place, and now that vessel is embolized. There will still be some flow through the nickel titanium mesh, but in due course of time, it gets thrombosed and blood flow cannot come in retrogradely into the aneurysm sac.

There are different kinds of embolism procedures. There are coils that are available that you can put in versus the Amplatzer vascular plug. We personally like the Amplatzer vascular plug because you don’t go deep into the smaller blood vessels and result in actual embolization of small blood vessels, which potentially can result in more complications. This is a safer option and more and more people are using it these days.

So, again, the proverbial pigtail. This seems like the catheter we use almost every time, and we are going to go up and with this, we will do our initial angiogram, which will highlight the aneurysm. A lot of times we cannot see the aneurysm because there’s excessive presence of thrombosed of clot within the aneurysm sac. So a lot of times you may do an angiogram and you may say, “Gees, my God, that’s not that big of an aneurysm.” But if you were to do a CAT scan, or, unfortunately, if somebody ruptures and do an autopsy specimen, in that case you will see that the lumen, which is what you’re seeing on an angiogram, is small, but if you did a CAT scan or if you were to look at it other wise, the aneurysm is pretty large.

Now as you can see here, it’s a pretty significant sac.
It's very deceptive, because you're only seeing the inside of the aneurysm where the blood is flowing. The outside may be two, three, four times as big as this, but there's no flow in it because of all the clots. So what you see is just the inside diameter. You see here one of our assistants marking where the kidney arteries come off, the renal arteries. You do not want to put a stent covering those branches, so we mark it on the thorascopic screen and then we know exactly how far in we should go with the stent where you to avoid the kidney artery.

And as you can see, we have to have access from both sides. We already have access from the left side, and now we have a wire going up from the right side. The safe place to park these wires is in the descending thoracic aorta, which is the downturn of the aorta in the chest. You certainly want to make sure that the wires are not reaching the heart of going up the great vessels in the neck and reaching the brain, and you have to be cognizant about that. These vessels are pretty fragile, and again, caution needs to be taken.

The other important thing is that the wires that we use, which are used to railroad these very large catheters, which house the stent grafts are very, very stiff. They're like coat hangers. You could potentially hang from these and they won't break. So a lot of caution has to be taken when you introduce these wires into the patient. You never introduce these wires right off the bat. You always put in what are known as “glide wires” first, which are very atraumatic, and once that is done introduce the Lunderquist or the step wires.

What we're showing now is, as I was alluding to the stent graft, the abdominal aortic stent graft is like a pair of trousers cut off, one leg is cut off, so we need to make sure that we orient the short leg in a fashion that we can approach it from the other side in a very quick fashion and be able to cannulate it. Because if you're not able to cannulate it, the whole process is kind of defeated. And then you have to go back and fall back on what are known as aorta unicraft and then do a fem bypass, and we'll discuss that a little later in the show as to how and when they should be done or need to be done at times, unfortunately.

So, again, in this situation now we have the stiff wire and we've taken our initial angiogram, and you see the dot on that Medtronic stent graft that outlines where the contralateral gate is going to open up, and it's a good cheating point, but you still have to make sure on the graft itself there are figure of eight sutures and make sure on fluoroscopic image as to where exactly it's going to open up. If you don't pay heed to that, a very simple case can very quickly turn into a nightmare.

And as you can see, over the Lunderquist wire now we're advancing the main body, and we know where the renals come off from, and we part them. There's a lot of angiographic images that are taken throughout the procedure. One of the things that we have to be cognizant of is the amount of contrast, IV contrast, or dye that we can give the patient, and we have to be careful about that. And a lot of times, patients have renal dysfunction. We have the kidney doctors evaluate the patient to optimize their kidney function and make sure that we hurt their kidneys in the least possible way.

Vince, what are your thoughts so far. We are almost ready to deploy the stent graft. Comparisons with open repair thus far?

Again, you can see everything on thoroscopy fluoroscopy. You can see exactly where your stent is going to go. It's an elegant operation. Now even though it seems kind of bloody, this is nothing compared to what an open procedure and the amount of blood loss can be with those kinds of open procedures.

So as you can see, as I'm dialing down the delivery system, the outer cover or the sheathe is coming down and the graft is flowering, and this graft is made of nickel and titanium. It has a property of going back to its original shape and size. And the other thing is that when it goes into the warmer bloodstream, the stent becomes rock hard. And if you had it outside, you would be
able to push on it and squish it. Once it’s in the bloodstream, it’s very difficult to compress it. And that’s what provides the stent graft with the radial force and applies pressure against the aortic wall and keeps it where it’s supposed to be.

And now, as you can see, the outer sheath is coming down, and soon enough, the contralateral gate is going to be open. And the contralateral gate is open. Yes, there it is.

And that’s the opening to the other leg, to the other side from which this stent was placed.

And here we’re going to take a picture, make sure the kidney arteries are in good shape. Now as you can see in this stent graft, there are stents which are going beyond the kidney arteries. These stents do not have the polyester covering and, therefore, are open. Obviously if the stent graft had the polyester covering until the end, in that case the kidney arteries would be covered and the graft would have to be pulled down.

So now the idea is to go ahead and cannulate the contralateral limb. This is a very important piece to the whole procedure. And as I was saying, you want to be sure that the contralateral gate opens in an anatomical location and angiographic location. Again, remember we are looking at two-dimensional images of an object that is actually three dimensional. So you really have to have a lot of experience to go ahead and cannulate these grafts in a quick fashion.

Now we’ve gone on ahead and powered up the X-ray. And as we can see larger, and they’re going to be moving this gantry in difference angles so we can see it in different lengths. It is very easy to put the wire behind the stent graft and make it look like you are within the stent graft, and that’s a mistake that you never want to do. And as you can see, this is Dr. Park manipulating the wire and cannulating the contralateral gate. And as you can see, sometimes it seems like you’re getting into the contralateral gate, but you are behind it or in front of it, and that’s why rotation of the camera is extremely important.

Sometimes this can be the step that prolongs the surgery. This can be something that happens at one minute. Sometimes it can take half an hour to try to get that wire into that little opening and making sure that you’re in the right position. It’s very tricky unless you’re done quite a few of these. I’m still in the learning process, and luckily I have Dr. Maini to back me up if I say, “That’s it, I can’t do it anymore,” then he’s there to manipulate it then.

It’s a team effort, and we bring our specialties together, and we’ve been able to provide excellent care to our patients. So once we do that, then there is a home groan way of making sure that you’re outside of it have stent graft. It’s nothing fancy. We take our pigtail back and we bring it down within the stent graft and we twirl it. And if you cannot twirl it, that means you’re outside the stent graft, that means you’re outside the stent graft, and it means you have to pull the wire back and rewrite the contralateral gate. And if you can turn it 350 degrees nicely, then you are in good shape. And for the last time, you may want to do an angiogram, or sometimes people like to do intravascular ultrasound procedures in very difficult cases and make sure that you are within the lumen. Although even though if you can turn, as you can see the picture is turning nicely within the stent graft, and therefore we know we are in.

The important thing in this is something that we will talk about when we show you the conduit procedure is the concept of cross clamping. There is no cross clamping or shutting off of the aorta that’s required when we do these procedures, which is a huge deal, and it’s the cross clamping which leads to a lot of cardiovascular morbidity and mortality at times, as well as kidney failure and sometimes leukemia or decreased blood flow to the gut as well.

Now, again, what we are going to do is we’re going to make sure there’s no air bubbles within the system. It’s a closed system. We’re going to make sure no air bubbles get into the vascular anatomy at all. So now, again, we have done an angiogram on the left side. We’ve identified the
bifurcation of the left iliac artery and go ahead, put the Lundquist with the stiff wife through, and now Dr. Park is putting the left side iliac extension through the left common femoral cut down.

Sometimes these are very stiff depending on how tortuous the iliacs are. The iliacs or are the access is the Holy Grail of endograft procedures and at the same time the Achilles heel as well. And as you can see on the angiogram, the stent graft is moving up very nicely. And you have to nice up the two figure-of-eights so that you make sure that enough overlap. And the figure eights are lining up nicely, and then we’re going to dial down the delivery system and flower the stent graft and open it. And it’s opening up very nicely.

You could see here that even though all the procedures that we demonstrated seem pretty routine and very simple to execute, they can be horrendous, and that’s when experience, expertise come into play. When things go as planned, it only takes a modicum of proficiency to do these stents and the patients do well. But it’s those instances, those abnormalities, those times when things don’t go as planned, that’s the difference in outcomes. And sometimes patients can have very poor outcomes.

I agree with Vince. And just for some housekeeping, we’ve been getting a lot of e-mails, and we will be answering these questions at the end of the show.

Now as you can see, we have taken out the iliac extension, and we’re going to go ahead and deploy the ipsilateral limb completely. If you remember we had no deployed the ipsilateral limb completely. We had stopped short when the contralateral gate had opened up, and that’s because you’ll have more support at that time, and you don’t want the graft to move to the contralateral gate that as the cannulated and the contralateral side has been deployed. And you can see the ipsilateral limb has been deployed.

Now if you remember, we had embolized. We are going to extend beyond the bifurcation of the iliac artery into the right external iliac artery, and that’s how the main body of the stent graft is coming out. And we’re going to go ahead with the right iliac extension.

It’s very important to make sure that the wires and all the catheters are well lubricated. That’s why you saw the scrub nurse put some saline on her hands. That’s got heparin in it. And here we are going ahead and putting the contralateral extension, and that gets deployed. After the deployment, what we normally like to do is iron out the creases with a balloon so that the stent graft is well opposed against the wall and do our final angiogram. And if all looks well, then we go ahead and repair the femoral arteries and call it a day.

A lot of times that does not happen. There are something known as endo leaks. There’s different types of endo leaks. There’s type-one endo leak which there’s blood leakage up north or south below, or there’s type-two endo leaks where there’s flow coming through the side branches coming through the aorta, and there’s type-three endo leaks where there’s leakage from the graft material from itself or from overlap points, and then there’s a point four-type endo leak, which is to the porosity itself. For the type-two and type-four endo leaks, nothing needs to be done on the table. Obviously for type-one and type-three endo leaks, measures need to be taken before you can get the patient off the table.

And that’s where you inflate the balloon. Again, for these procedures, patients are anesthetized with general anesthesia. There are times when you may want to give them just deep sedation depending on their cardiovascular and pulmonary or lung issues. If they’re very sick we cannot do general anesthesia for these people, but for all intents and purposes, it is general anesthesia. And you can see the balloon go up and the final images are going to be here soon.

This will be the completion angiogram where we shoot dye down the aorta and then we can see the final repair. And this looks very nice flow down both legs, no leaks noted.
That was a good case.

It went really well.

Yeah, that was a good one. The patient did well. And incidentally, I was talking to the patient, and he’s probably watching the video himself right now, and I hope he’s liking his insides and sends us a good e-mail.

Vince has this model to show us.

Yes. We’ve received several e-mails about, “Why can’t I have a stent for my aneurysm. Where is the stent, you know, and so forth.” This is just a model of what a stent looks like within the aorta. Now the bubble represents an aneurysm. The aorta is like a garden hose that starts from your heart, kind of makes a loop going up to your chest, and you can see these branches going up to your brain, and then it goes down the back of your chest into your belly and down, and makes that wide -- that split into the legs.

The part of the aorta that comes right out of the heart, the ascending aorta cannot have a repair by a stent. There is no technology for that right now. Several patients have had what’s called the ascending aortic dissection where the aorta is tearing, or an aneurysm. The ascending aorta can only be fixed with an open heart procedure at this time. This is also an aneurysm in the chest, but as you can see it’s going down the chest into the belly. This is also a chest aneurysm, but it’s a descending aortic aneurysm that can be stented, and we’ll show you that in a little bit how this is performed. And then, of course, down in the belly was what we just showed you.

An abdominal aortic aneurysm, many of which can be stented, and preferential treatment is with the stent due to less incision, less stress; however there are still some patients that have to be treated with the old-fashioned open aneurysm repairs.

This is the same graft that we just showed you deployed, and if you look here, that’s the contralateral limb or the leg of the trouser that’s cut off, and that’s where the wire has to go in and the other limb comes down, and this is the material. And as I said, this is very pliable, soft, but once it gets inside the body, you will not be able to squish it the way I am right now. So let’s go on ahead and show the thoracic conduit footage now.

You can see a patient that could not have a stent placed through the groin arteries. The thoracic aortic stents are much larger than the abdominal aortic stents, and so a lot of times patients cannot get this big rod shoved up the groin artery. In this situation we had to open up her belly and basically find the abdominal aorta, as well as the branches that go to the legs, that kind of upside down Y that you saw.

Now as you can see here, there’s a lot of blood. These large metal retractors are holding bowel out of the way. There’s a lot of time that’s needed to get me down to the abdominal aorta just to expose it. What I’m doing now is I’m passing a tube of graft from the belly out through the groin. This tube will act as the new groin artery so Dr. Maini can pass the thoracic aortic stent up through the abdominal aorta into the descending aorta. You see that tubular device or that tubular structure; that is an artificial tube, an artificial graft. This will act as the new artery.

Now in this particular patient, she had a blockage not only in the groin artery but also in one of the limbs of the Y that go to the legs. So I could not even sew it into the iliac artery; that’s one of the Y. I had to go right to her abdominal aorta. At the end of this procedure, she will get an added benefit of this graft being sewn into the groin artery passed those blockages, so she will get more blood flow into that leg beyond the blockages that prevented us from placing the thoracic stent to begin with.
I have this clamp that I’m about to place on the abdominal aorta. As you can see, it’s like a C, and it basically isolates the anterior or front portion of the abdominal aorta. The clamp does not have to go all the way across the aorta and stop flowing. It only has to stop blood flowing from just the front or anterior portion of the aorta in order for many to make an incision and sew this graft into it.

The old-fashioned way of fixing an abdominal aorta would require, again, opening up the belly like we’ve done here, placing all those retractors, moving the bowel out of the way, but I would have to place a clamp all the way across the aorta and all the way across the bottom of the iliac arteries or past the upside-down Y so that there wouldn’t be blood flowing into the artery while I’ll cutting it out and sewing in the artificial tube.

You see here I’m manipulating the aorta, about to make an incision and extend it so that the opening is large enough to accommodate this artificial tube, which I’ll sew into the aorta. Now you can see that I have an assistant holding the tube and also providing suction to suck out any blood. We, Dr. Maini and I, always have certain kind of blood recirculators so the patient gets back any excess blood that they would otherwise lose, which cuts down a lot on blood transfusions.

But even then, you can tell that this can be quite a bloody procedure, and this is only to get access, this is not the actual stent procedure for the thoracic aneurysm. This is just so Dr. Maini can place the stent in. So the magnitude of this surgery can be quite large.

As you were saying, 25 to 35% of our patient population requires conduit, and the rest of them we can do it through a common femoral cut down, as the case we just showed you. As you are doing more and more complicated cases the incidents of the use of conduit is going up.

The other thing that I want to mention is there’s a risk of having paraplegia or weakness of the lower extremities after a thoracic stent graft. In the open surgical literature the risk of having paraplegia was about 10% and sometimes went as high as 15%. There are some anecdotal studies as to how you can decrease that incidents, but to this day, there were no trials that were done to show that if you did this or you did that the risk of paraplegia would decrease.

Ever since the advent of stent grafts, and especially the use of conduit and all, and with the trials, the incidents of paraplegia is markedly lower, about 1 to 2%, or sometimes even less. And since a lot more patients are being done now since the approval of these devices, a lot of new thoughts have come about, and one of them is that every patient in the right circumstances gets a spinal drain, which is like getting a stick in the lumbar spine and go into the sac that contains the cerebral spinal fluid, and you attach a pressure monitor to it and you like to keep the pressure at 10 millimeters. That is extremely important because that has been shown in anecdotal studies and our own personal experience at our institute that as end, you make sure that you keep the pressure or the PSI, pressure inside the brain and the spinal cord to 10, the incidents of paraplegia is much less.

The other thing that we do to improve the safety of this procedure is to have continuous electrophysiological monitoring, and you can monitor throughout the procedure the neural systems, especially the spinal cord, the sensory and motor systems, and if there’s any decrease in the sensory or motor reflexes, the electrophysiologist informs us of that, and what we do is we make sure that the pressure is down to ten. If we need to decrease it is down, we decrease some more CSF fluid, or we need to make sure that the blood pressure is not dropping. It’s extremely important that the blood pressure remains good at all times, and even a little bit on the higher end.

These spinal drains are usually kept in place for 24 to 48 hours after the surgery. There is a small risk of having paraplegia even 24/48 hours after a successful stent graft repair. There have been some instances at other institutes where patient went home after surgical thoracic stent
graft repair and were a few days out, and on their way home developed paraplegia, and the only treatment at that time is to go ahead and spinal drain, drain off the CSF, get their pressure down, get their blood pressure up, and these patients usually recover or, at least the degree of paraplegia is less.

I cannot stress the importance at this point of the surgery of having good assistants. And, Brij, if you remember when we first started doing this, the only PA that really was able to help me was Janine Gropman [PH].

Yeah.

And she received specialized training. This was very new to the Harrisburg area.

Yeah.

I don’t believe anyone else within the region had been doing this.

That’s right, yes.

And it made a big different. You can tell a big difference in how well a surgery goes with someone like Janine and her efficiency and her knowledge versus getting any old assistant or a resident or someone who does no have the basic training for assisting in some procedure such as this.

Again, when everything goes by the book, when everything goes like a cook book, that’s fine. You can get residents. You can get anybody to help you. But it’s these moments when things do not go as planned when there are things that you have never seen before, that’s when experience and that’s when good assistance really comes in handy.

I cannot emphasize that more, and I have to say, we have been very lucky with our operating room staff, and especially the vascular nurses that we have, and more often than not, you know, these people have stayed back late hours beyond their call of duty and have helped us take care of patients. And it’s a team effort, and that’s how our program is blossoming and doing so well and patients are doing so well.

Again, you see basically the graft being sewn into the abdominal aorta. This graft is going to be an artificial artery for this patient. It’s tedious. At times it can be very stressful, and the rewards are great, however, if you take the time to do it right.

So that’s the panoramic view of our operating room, and this is really one of the newest technologies in the country, and we have a stand-alone operating room table on the side, which sometimes we use, and we can transfer the C-arm from one table to the other, and it works beautifully well. And as you can see -- I call it the “big contraption,” and on the patient’s belly, that was used to hold the patient’s belly open and keep the gut away. And as you can see, the conduit is now coming up straight through the aorta through the cut down on the left side, and you can see it pulsating nicely, and we go ahead and use this conduit as an access.

And as Dr. Park was mentioning, that we will use this conduit to bypass that patient’s occluding left side so that she is going to get benefit from improved blood supply to her left lower extremity and her symptoms of provocation of pain in her lower extremity would improve as well. That’s an added side benefit of doing the conduit. Even though you don’t do the conduit just to allow blood to go to left leg, that’s just a secondary benefit that the patient would derive. If he were able to do this without putting the conduit in, we would certainly do it that way.

And as you can see, what we are going we’re are putting in small catheter on the right side, and that will be a completely percutaneous approach, and we want to do as less of cutting as
possible. That’s the goal of doing these procedures. And through that side we’ll be having our angiographic catheters and take pictures of the descending thoracic aorta.

I can’t emphasize enough, as you see the panoramic view of the operating room staff, we have an excellent staff at Pinnacle Health, and it’s not only the nurses and the anesthesiologists and the OR techs and physicians assistants but also if you have an experienced and well-trained rep for the stent. We have been fortunate to have Johnny Debornadis [PH] of Medtronic help us with -- he’s seen so many of these stents. He has so many different clients and so many different year of experience that he’s seen things probably that you and I haven’t seen, Brij.

That’s right.

Every now and then he’ll put in his two cents and give us a new perspective on things. And I know I have received several e-mails about him. And if you can hold off, we’ll try to get a date for him.

So as you can see, we are putting the catheter on the right side, which would be our angiographic catheter. And I’m amazed by the conduit and as to how well its functions and how easy it becomes after the conduit is put in. I kid you not, before people started using conduits for placing thoracic stent grafts, unfortunately, there were some complications that people had around the country, and that’s how this has almost become standard of care that if you have an iliac or an access which is not optimal, you don’t even try going through the groin directly because the chance of having a complication is much, much higher than the risk of going through and opening the belly and putting in a conduit even though it looks like a huge procedure.

Right. That brings up the important point about the open procedures for a thoracic stent or even a thoracic stent that extended into the abdomen, the kind of incision that would be necessary basically from a patient’s chest all the way down to the belly. If you can imagine a large gash like that, the kind of debility a patient would have afterwards -- pain, suffering, that’s what the old-fashioned method was.

Now hopefully with more advances we may not even have to open the belly and place conduits to put these stents. And for those patients out there who have had open thoracic stents -- excuse me open thoracic aneurysm surgery, you can imagine how much better just a couple cuts in the groin would be in terms of post operative recuperation, pain, suffering, and also a decrease chance of complication such as paralysis.

And I mentioned how opening up the belly you see blood, guts, and aneurysm, well imagine doing the chest as well, then you have blood guts, and lung, and you have everything all in your way. Sometimes a horrendous surgery, a horrendous surgery with a surgical success, but patients afterwards, are left with a lot of problems, and with the advent of these stents, they can lead a good quality of life.

You know, these conduits never fail to amaze me, and, you know, every time we do them, you know, I always think, “Wow, that was a good job done.” And I think I’m going to say it again, good job, Vince, and you make this procedure a success, because I know for sure we’re not going to be able to help these patients without that.

What I would do now is right after this footage, let’s show the patient’s angiogram right after that. All right. So great case, Vince, and so let’s show the angiograms of this patient that we just did the conduit on.

Okay. So this patient, which we just showed, had a penetrating ulcer, as you can see, on the left side, and this patient, as I said before, was having severe back pain and went through a complete cardiac workup, including a cardiac catheter procedure. Did not find any coronary disease, had a GI workup, and incidentally had a CAT scan done. It showed this large penetrating ulcer.
So here we go up with our pigtail yet again, put in a thoracic stent graft, place it appropriately, and deploy that. Pull the pigtail back, take another picture, see the ulcer. The idea is to stay away from the celiac access or the blood vessel going to the liver or the spleen because right above that comes out the vessel that goes to the spinal cord, and you want to stay away -- as far away from it as possible. The closer you come to it, the higher the risk of paraplegia. And, again, sometimes you have to come closer to it, but if you have to do it then you have to do it. And you have to follow the instructions used as set up by the FDA and as per company guidelines and the ISU and take care of patients accordingly.

Vince, any statement or comments before we go onto these wonderful e-mail questions we have from our viewers?

No. I think we should take the time to try to answer some of these questions. If I can start, I get several questions from patients what to expect afterwards, what kind of problems will I have after I leave the hospital? For the abdominal aortic stent and for those stents of the thoracic aorta we can do through the groin, really, the biggest problem would be the wounds, the groin wounds, and trying to have them heal properly.

Now a lot of times the groin, it’s moist, patients walk and the creases in the groin can chafe the skin. A lot of times the wounds can tear open and there will be a wound infection. We do instruct our patients to watch themselves, cover their wounds. There are basically three different channels that go from the body into the legs. You have an artery that takes blood to the leg, vein that brings blood away from the leg, and something called “lymphatics,” these channels that carry water. Afterwards you can have a lot of swelling in the groin. Sometimes in male patients the swelling can be so severe it goes into the middle and the scrotum as well. In those situations, we check to see if any of those three different vessels are leaking or bleeding.

If there’s a bleed then obviously we need to stop it from bleeder. If it’s just water from those channels, those lymphatics, most of the time they will heal with scarring. The body will reabsorb it, the swelling will go down. Unfortunately, it can be quite uncomfortable as well. If there are any complications, that is probably the most frequent one that I have seen, and there always are phone numbers to call if something happens with the wounds you’re not sure about.

The other thing is for us as far as follow up is concerned, what we normally do after every successful stent graft we like to do a CAT scan, and that is usually done at three months, followed every six months with either an ultrasound or a CAT scan, and that’s an FDA regulation that you need to monitor these aneurysms on a very regular basis.

And as I was alluding to, there are endo leaks that can happen, and as and when they happen, we take care of them. The incidents of having an endo leak is minimal. The other thing that I do want to allude to is whether you get open surgery or whether you get a stent graft, there are incidents of repeat procedures. The incidents of repeat procedures is similar. This was published in “New England Journal of Medicine” last year, and this was a very large trial and very well exemplified. So regardless, whether you get an open repair or a stent graft repair, there will be incidental repeat procedures, and that’s the nature of the beast.

The second question that we have here, this person asks, “I have an aortic aneurysm, which is four centimeters and an iliac aneurysm, which is three centimeters, am I a good candidate for the stent graft?” Well I’m going to answer this question in a couple of ways. The first thing is how long have you known that you’ve had this? Have you had ultrasounds or CAT scans? What has been the rate of increase of your abdominal aortic aneurysm or your iliac aneurysm?

The rule of thumb is that if the artery is more than twice its normal size, then it needs to be repaired. As far as the abdominal aortic enlargement is concerned, a four centimeter, as we showed you in the animation, there is no need to repair it at this point in time. Now having said
that, if you look at the iliac aneurysm or the ectasia or the enlargement that you have, it is three centimeters, which is more than twice the size, so that would meet criteria to have it fixed. Now if you’re going to get the iliac aneurysm fixed, you’re not going to go ahead and fix the iliac aneurysm and leave the abdominal aorta alone. You’re going to fix the whole thing.

So, again, what I would suggest is go ahead and have a physician, find out if you’ve had a CAT scan, not had a CAT scan, and then based on the CAT scan, then a decision can be made if this needs to be repaired, not repaired, or you need follow-up surveillance at this time.

There was another e-mail regarding “How do I know I have an aneurysm? Should I be checked?” And some of those statistics that you saw at the beginning, 90% of patients don’t realize they have an aneurysm. About 48,000 individuals die in this country from their aneurysm bursting, either a the chest aneurysm or the belly aneurysms, so how do you know if you have an aneurysm?

One e-mail stated that there were five siblings who had aneurysms, brothers and sisters that had aneurysms, “should I get checked?” I think in a situation like that, that there’s probably some family hereditary component to aneurysm. I would definitely get my family doctor to check me out for aneurysm.

I would agree with that, yeah.

There are simple ways, noninvasive ways like ultrasound. There are a lot of these light screenings that come to hospitals and libraries and churches that can do a quick ultrasound to get an idea of what you’re aneurysms are like, or what you’re aortas are like. The other patients who don’t have family history, who don’t have any kind of predispositions, it can it be difficult to determine whether you have an aneurysm or not. The best thing is a physical exam.

You go to your family doctor for a yearly check up, a good family doctor or yearly check up. A good family practitioner or internist can with their stethoscope and with their hands be able to diagnose whether you have an aneurysm or not. Believe it or not, with all this technology we’re talking about today, there are still the skills of a good family practitioner with their stethoscope and there are hands to be able to be able to determine if you have an aneurysm or risk of an aneurysm. And then there’s always a chance of further tests in case the findings are no so clear.

The next question comes from a patient’s son, and apparently the father had a stent graft put in and he made the son and daughters watch, and so thank you dad for asking your kids to watch. And the other question is from somebody who has a descending aortic dissection, and the question he asks is, “If I develop an aneurysm, could I be a candidate for a stent?” The answer is twofold.

For descending thoracic aortic dissection, stent graft is not approved as of yet. There are ongoing trials and trials that are being designed at this point, and hopefully they will be underway soon and we’ll have more data as to whether for type-B dissections or descending thoracic dissections, are stent grafts the treatment of choice? There are some off label user products where in certain situation, extreme situations to save a life where stent grafts have been used. **

Now if there is aneurysm dilation in a dissection, which is the natural progression of a dissection, if that happens, you develop an aneurysm, yes, there is a good possibility that a stent graft may be use. But as of yet, dissections are not approved indications for stent grafting.

There was a question about who can do these stents, who can do these stent surgeries? Right now there’s really no one particular field that can do stent surgeries. I’m a cardiac surgeon. Dr. Maini is a cardiologist, an interventional cardiologist. There are some places where radiologists, interventional radiologists do these procedures. Many vascular surgeons do these procedures.
So there is no one particular field that can do these stent surgeries. What’s paramount is the type of experience, the type of training that your particular surgeon or interventionalist has received.

Those are questions that you need to ask when you go to see your surgeon or cardiologist about your aortic aneurysm and about stents versus open surgery. You need to ask, “Well how many of these have you done? How long have you been doing these?” A lot of times you have to learn at some point, and this is a new field, this is relatively new, especially the thoracic aortic stents. The abdominal aortic stents have been around for a quite a while. But you want to make sure that you have a trust in your surgeon. You want to make sure that they have enough experience so that if something does happen that does no follow the routine, that they can get you and themselves out of trouble.

The other question is, “How do you see where the needle is going to,” and that question is for Dr. Park.

The needle for the abdominal aortic, and even for the thoracic aortic stents, we do open up the groin, so we make an incision in the groins. We open up everything we move the muscle, fat, everything out of the way until we see the arteries in the groin. Then, just with your eye, you just poke the needle right into the artery. You will see blood squirting back. And if you remember -- you may be able to go back and see the films again if you sign up again -- the wire is being passed up to the through the needle. And then once it's inside the body, you have rely upon the X-ray machine, the fluoroscope. Then you can see the wires going up into the aorta. You can see exactly where you need to go.

The other question is from the son of a patient who is being asked to go for open surgery in Philadelphia, and this is for an ascending aneurysm. As Dr. Park was alluding to, ascending aneurysms are yet not able to be treated with stent graft. It’s only descending and abdominal aortic aneurysms and downstream that can be treated. So if your mom needs to go for open chest surgery, that is the right way of taking care of her aneurysm at this point in time.

In the future, will ascending aortic aneurysms be repaired endovascularly?” My guess is, yes, but at the current time, the answer is, “No.” The other very pertinent question is, “What are the chances of ruptured aneurysms during the procedure?” As I was saying, the Achilles heel of stent grafting is the access vessels. Once the patient is on the operating room table, the bad outcome is not from the aneurysm itself, it’s from the access vessels. So if somebody has an attending aneurysm and you are on the table getting an operation, the aneurysm is likely not to rupture, but the problem might happen is from the iliac.

Now we do take care of patients who come in whose aneurysms who have already ruptured of pre-rupture. These patients can obviously rupture because as time goes by, they are in the process of rupturing, so that can certainly happening. But the chance of the aneurysm itself rupturing during the procedure is extremely minimal.

The next question is, “How long does the procedure take from start to finish?” And, Vince, why don’t you answer that.

Well through the magic of editing -- and actually Dr. Maini did most of the editing himself with his computer, two of these surgeries were compressed down to 45 minutes or so, and that is not the case. The abdominal aortic stenting routinely can be anywhere from two to four hours. The thoracic stenting, depending on whether a conduit is necessary, that can take, four, six, eight hours. I have heard but I have not experienced, and not knock on wood I won’t, some of these surgeries taking 12 hours or so, so it really depending on the individual patients themselves, their anatomy, how difficult. Not all aneurysms are the same. It depends on the experience of the surgeon and also the staff.
Again, that operating room is not just one person, and we really rely upon every member of the operating room. And it doesn’t matter their rank or training -- excuse me rank or what field they are in. I would take an OR tech, some of the OR techs at Pinnacle Health over MD, PHD, cardio thoracic surgeons at the Cleveland Clinic because I know their skills and I know what they can do to help me get the patient through the surgery. So the time is variable, but routinely, hopefully within two to six hours for any of these surgeries.

Sure. We just have time left for a couple more questions. One of the important questions that was asked was, “Due to the relatively large size of the aorta, why is heparin necessary?” The reason why heparin is necessary is you are occluding the blood vessels in these large tubes, and if you do not heparinize the blood vessels beyond where the graft goes in can get occluded, and that’s a huge, huge problem. Any time you put in a foreign object inside the bloodstream it’s likely to clot up. So to prevent the equipment and the distal vessels from the clotting off, you have to heparinize the patient.

The other question is, “What percentage of surgeries are successful when that are no rupture of the abdominal aorta?” The success rate is 99-plus percent, and with the good technology, the good grafts that we have, the good fluoroscopic machinery and equipment that we have these days, the success rate is very, very high.

And the last question that I want to answer for tonight is the question says, “I have had a history of kidney stones. Fortunately I’ve had to pass them. At one point, my urologist ordered X-rays. But with injected iodine I have had an adverse reaction that greatly concerned the doctors, and do you use iodine for this procedure? What do you advise if I need that injection should I develop a triple A?”

Well the answer to that question is it’s not that big of a deal. We premedicate all our patients with steroids and Benadryl, and this is a very common occurrence, and people do extremely well if pre-treated appropriately with steroids.

Unfortunately we are running out of time, and what we’re going to talk about for a brief second is vascular screening availability. This is something that is available at Pinnacle Health, and people need to get screened, and for people who are familiar with the Save Act, this was an Act, which was passed by Congress last year. And if you are male, especially a male and you are a smoker and you are more than 65, it almost behooves you to go ahead and get vascular ultrasound done to make sure you do not have an abdominal aortic aneurysm.

The more the risk factors that you have, the higher the chance that you will have an aneurysm, either in the chest or the abdomen, so if you have those conditions, please go ahead and make an appointment. You can do that either at Pinnacle, and this is many other societies that do these screenings as well. And sometimes they’re even available at churches and schools, and please make use of them and get diagnosed, because aneurysms are silent killers and they are usually asymptomatic, and you will not know whether you have an aneurysm or not until it’s too late. Vince, any closing remarks?

No. I appreciate the opportunity to present this to everyone. Thank you very much for tuning in. I hope it was worth your time, and thank you for working with me, Brij, and it’s been a pleasure working with you today.

Thank you, and likewise. And as Vince said, this is a team effort, and it certainly is. I can assure you that our program would not be where it is today without Vince. And I want to thank a few more people without whose help none of this would be possible, and that’s Susan Riley and Tracey from our offices, and hats off to them for all the mess they take care of.

Absolutely.
And all the people in the operating room, and there's too many of them, but thank you very, very much for making this into a success. Thank you, and have a good evening.

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