Electrophysiological Study and Catheter Ablation
Mercy Hospital
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ANNOUNCER: Welcome to Mercy Hospital in Miami, Florida. Over the next hour, you'll see and electrophysiological study and catheter ablation with 3D mapping. During the procedure, doctors look at the electrical system of the heart by recording the electrical activity from within the chambers of the heart, then catheters are advanced into the heart through a small tube, to see if the irregular heartbeat can be reproduced. Doctors can then perform the ablation, in which radio frequency energy is delivered through a catheter that is in contact with the abnormal pathway or focus. OR-Live makes it easy for you to learn more. Just click on the "Request Information" button on your webcast screen and open the door to informed medical care. Now, let's join the doctors.
00:01:01
PETER V. GARCIA, MD: Good evening and welcome to Mercy Hospital. I'm Dr. Peter Garcia. You'll be joining us for a live webcam, where we'll perform a electrophysiology study with ablation, using our 3D mapping system. Keep in mind, that during the procedure, if you have any questions, please click on your screen and we'll be able to answer your questions live during the procedure. This procedure is performed to treat patients with cardiac arrhythmias and we'll give you a live, up-close view on how this is performed. Now come along with me and we're going to introduce you to Dr. Al Interian, Jr., who will be performing the procedure. This is Dr. Al Interian, Jr. He's going to be performing the procedure this evening while you join us. He's actually one of the pioneers in this procedure. He's developed many of the techniques and many of the technology used to perform these procedures. Dr. Interian?
00:02:03
ALBERTO INTERIAN, MD: Thank you, Peter. I'd like to welcome everybody to Mercy Hospital's Arrhythmia Syncope Center. Today we're going to be doing an ablation for atrial flutter. Atrial flutter and fibrillation are arrhythmias that afflict primarily elder patient. They can be sort of life threatening. They tend to lead to clot formation and stroke. This patient is 78 years old, has a history of hypertension, diabetes, and some other ailments, including increased cholesterol, first presented with – in the past, with sick sinus syndrome. So, he had a DDD pacemaker placed. Then most recently, he had a TIA, a minor little stroke. At that time, an EKG was done and he was found to be in this atrial flutter, atrial fibrillation, primarily atrial flutter. A transesophageal echo done at that time revealed that he had a small clot in his left atrial appendage. At that time, was put on blood thinners for the hope of resolving the clot. This was done approximately six weeks ago. Now he's being brought – He had a transesophageal echo done by Dr. Garcia, which showed an organization of the clot and almost total resolution. We are now going to try to restore him back to his normal rhythm, get him out of this arrhythmia, hopefully, and really if everything

goes well, in another six weeks, he has the potential of being able to come off blood thinner. So, we'll go ahead and get started. Peter?
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PETER V. GARCIA, MD: Mm-hmm.
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ALBERTO INTERIAN, MD: Anything you want to comment on?
00:03:53
PETER V. GARCIA, MD: Yes. Maybe you could tell the viewers what the benefits of ablation is for this type of arrhythmia, as opposed to medical therapy?
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ALBERTO INTERIAN, MD: Sure. That's a very good question. Medical therapy really doesn't cure you. It just controls the arrhythmia and the patient's really at risk of having this arrhythmia recur at any time. As I had stated in the past, blood clots can be formed from this arrhythmia, so unless you're chronically anticoagulated, the risk is still there. I'm in a process of putting catheters up into the heart. We have put sheaths in both the right and left groin. Using fluoroscopic guidance, we're going to guide these sheaths up into the heart. You can see that, in this case we have a catheter with ten platinum electrodes in it. Cindy, you want to hook up the catheter? And this is going to use to map. We're also going to use this to create a three-dimensional hologram-type picture. With the three-dimensional mapping tool, you'll be able to see this. I want to start doing this right now. We're basically, right now, in the right atrium. We're going up into the superior vena cava, which is one of the major vessels that feeds the heart. Okay, if you collect these points, I'm in the SVC right now. Okay, I'm going to be coming down the SVC into the right atrium.
00:05:39
PETER V. GARCIA, MD: Okay. Now, one of the important points here to notice is that we also do these procedures with just conscious sedation. General anesthesia is not needed or used and we use local anesthetic in the groin, so the recovery time is very quick. Often these patients can go home the same day of their procedure. Now, as you can see, Dr. Interian's manipulating the larger catheter, to the left of the screen, in the right atrium and that's going to give us electrical activation in the right side of the heart. You can see on the right side of the screen, there's another catheter with four electrodes on it and that's giving us electrical activation through the left side of the heart, or the left atrium. These catheters help us distinguish the type of arrhythmia the patient has and also helps us perform the ablation procedure.
00:06:40
ALBERTO INTERIAN, MD: I'm trying to create the shell by collecting the points and you can see in the three-dimensional ESI screen, you can see the creation of the shield. What is wrong with him? Okay. Is he asleep? Okay, fine. Hold off on the Versed, okay?
00:07:09
PETER V. GARCIA, MD: Now, you can see in this patient, as he has pacemaker wires already in the heart, we're very careful not to move those catheters.
00:07:17
ALBERTO INTERIAN, MD: This is the tricuspid annulus. More of the tricuspid annulus. More. More. More. Just rolling over the tricuspid valve. That's a ventricle right there. This is the base of the right atrium. I think… Okay, now I'm in the inferior vena cava, which is the other main vessel that feeds the heart. Okay. How's that diagram going? Huh? Any areas you want me to pick up? Again, I'm in the ventricle right now. This is the coronary sinus, right there, if you see it. Reverse it.
00:08:25
PETER V. GARCIA, MD: Now, the coronary sinus, you can't visually see the coronary sinus, but if you look to the right of the screen, the catheter extending all the way to

the right is within the coronary sinus. The coronary sinus is actually a little vein that runs behind the left atrium, on the left side of the heart. The electrical circuit that causes this arrhythmia originates in the right side of the heart and the electrical activation, after originating in the right side of the heart, then travels to the left side of the heart. Now once the 3D map is made of the atrium, where the arrhythmia is located, we can proceed with the ablation procedure and that can be done without fluoroscopy, without x-ray, exposure to the patient. Also, when the ablation is started, we're delivering little burns to the muscle of the heart to terminate the arrhythmia and get rid of the circuit of the arrhythmia, and we can locate and go back to those areas very specifically and precisely using the mapping system.
00:09:26
[indistinct conversation]
00:09:29
ALBERTO INTERIAN, MD: Scott, leave him alone. He's fine. [indistinct conversation] Let me have the HiSS catheter, Cindy. [indistinct] Now, as the patient is only receiving conscious sedation, you may hear during the procedure that he wakes up a little bit, because he's receiving so-called twilight sedation, but he's otherwise comfortable throughout the procedure and we avoid the risks of general anesthesia by performing the procedure in this fashion. I'm putting another catheter up and this is going to go into the HiSS area. I like using this catheter; it's a catheter I designed years ago for taking the HiSS image. It's got a little longer area at the tip and the electrodes are a little bit behind it. I think it works pretty good for getting HiSS electrographs.
00:10:55
PETER V. GARCIA, MD: Now, the HiSS catheter that's being placed is also being placed in the right side of the heart, against the septum, so a different area in the right side of the heart, and again the electrical activation in the heart during the arrhythmia allows us to distinguish this type of arrhythmia from other types of arrhythmias.
00:11:12
ALBERTO INTERIAN, MD: [indistinct] Can you go ahead and pace and see if you can entrain the arrhythmia please, the flutter, which is what it looks like?
00:11:27
PETER V. GARCIA, MD: Now, besides looking at the electrical activation when we pace from certain areas of the heart, we actually capture the electrical circuit to confirm again that the arrhythmia we're dealing with is atrial flutter.
00:11:39
ALBERTO INTERIAN, MD: Right now I've placed all the catheter that I need for the diagnostic part. I have one in the coronary sinus, one near the HiSS area, and what I've asked one of my associates is that – You have a HiSS there, Ernie? Can you grab that HiSS? You see it? You see it? Okay, measure the Hb, please. You have a nice Hb there and I want to entrain it so we're going to pace from the coronary sinus because, looking at the surface ECG, we can look at the EKG screen, by the way the activation's going, it looks like it's counterclockwise flutter. We placed that decapolar catheter up there and a HiSS catheter, and seeing the sequence of activation, it looks like counterclockwise flutter, which uses the area near the coronary sinus, where that first catheter was placed as part of the circuit. So we're going to try to pace from there and see if we can capture that circuit. If we capture a circuit, it means we're in the right area and that's where we're going to go and burn and hopefully cure this gentleman of this bothersome arrhythmia, and potentially life threatening, if we think about a stroke.
00:12:57

PETER V. GARCIA, MD: If you look quickly at the EKG there, you can see the electrical potentials from the catheters within the heart, which Dr. Interian was describing. On that screen you see that the real-time electrical activation of the heart during the arrhythmia. Now, we correlate this with the 3D mapping images.
00:13:22
ALBERTO INTERIAN, MD: Ernie, put my mapping catheter up.
00:13:25
PETER V. GARCIA, MD: To help confirm the type of arrhythmia this patient has.
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[indistinct conversation]
00:13:35
ALBERTO INTERIAN, MD: If you look at that yellow line – Hook me up there, Cindy, and let's get the flush going. EKG. Oh yeah. That's right. That's right. Let's flush it. Let's flush it.
00:13:55
PETER V. GARCIA, MD: Now, the yellow line on the screen is going to show the electrical activation from the ablation catheter. That's the actual catheter that delivers the radio frequency energy to cause the burns in the heart that get rid of the electrical circuit causing this arrhythmia. When Dr. Interian positions that catheter within that area of the circuit of this arrhythmia, we'll know the electrical potentials specific for this arrhythmia.
00:14:24
ALBERTO INTERIAN, MD: So, what we're doing right now, we're using a saline-irrigated catheter. This catheter, the tip here we're seeing heats up – Scott, can you flush that please so I can see – and water comes out of it. Let's go, Scott. You see the water coming out, dripping there? You see it? Right there? See it? See, it's like a little shower? You see it? Well, what happens, this cools the interface of the tissue and the tip that we're heating up. Atrial flutter, the areas you have to cauterize or ablate can be very deep and by using this saline-irrigated, it allows us to burn longer so no charring occurs at the tip and it also lets us penetrate below the surface to get a deeper burn. So that's why we take this saline-irrigated catheter to do this procedure.
00:15:16
PETER V. GARCIA, MD: If we go to the fluoro image, we can now watch the catheter being advanced through the vena cava up into the heart, and then under fluoroscopy on the x-ray image, the catheter's going to be positioned in the area of the atrial flutter circuit, which is in the base of the right atrium. Now, once the catheter's in the heart, that catheter will appear also on the 3D image and we can look over to the three-dimensional image now. And shortly we'll see the – once we get our connections squared away here, you'll be able to see the ablation catheter on the 3D image.
00:16:07
ALBERTO INTERIAN, MD: Hey Ernie, I don't have a signal on my ablation. Ernie, I don't have a signal on my ablation catheter.
00:16:16
[indistinct conversation]
00:16:19
PETER V. GARCIA, MD: Now again, through much of the remainder of the ablation, the remainder of the ablation procedure, we don't have to use x-ray once we've located that catheter on the screen.
00:16:31

ALBERTO INTERIAN, MD: Okay, we're okay. Yeah, now we are. The tail wasn't properly connected. All right. You can see the yellow – Have you optimized yet? ESI please.
00:16:45
PETER V. GARCIA, MD: Now we're locating the ablation catheter with the 3D image. You can see it there, it's the white catheter on the 3D image with the white tip. Once we get everything calibrated, Dr. Interian will start moving that catheter into the area of the atrial flutter circuit. Now, the technology for these catheters has advanced tremendously over the last few years. Initially the ablations used to be performed by shock ablations, where actually electrical shocks were delivered through the catheter to cause the damage to the circuit to cure these arrhythmias. Now we use these very specialized catheters that really allow us to focus on a specific area without damage to other areas of the heart during the procedure. Okay. Now looking at the 3D map, you'll see an image to the left of the screen and one to the right and these are different orientations of the heart, one with the heart facing us a little bit to the right, and one looking from below the heart from the left side, and we're looking at basically two dimensions on the screen, but these images we can actually rotate in whatever degree or dimension we want to look at the catheters from other views, but these are the standard views we look at. Now, the ablation catheter is being positioned near the tricuspid valve, and on the atrial side of the tricuspid valve, that's where the circuit originates. Dr. Interian now is delivering the radio frequency pulses that create the cautery burns that will eventually terminate this arrhythmia and get rid of the electrical circuit. And as he creates one of these burns in the heart, we'll be marking the points with a different colored dot. That way we know which areas we've performed the ablation in. Again, we're just calibrating the equipment here.
00:19:27
ALBERTO INTERIAN, MD: You're doing the same thing over again. That's not going to do it.
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PETER V. GARCIA, MD: While we're waiting to set up, we'll take a few questions that have come across the Internet live. One of them is, "Will this ablation procedure work for atrial fibrillation?" This ablation procedure can also be used for atrial fibrillation, mainly best served for what's called focal atrial fibrillation, atrial fibrillation that originates from the left side of the heart, around the pulmonary vein, and although the procedure's a little more technically complicated for atrial fibrillation, it can also be performed to cure atrial fibrillation in many patients. Atrial fibrillation is similar to atrial flutter, however more of a disorganized arrhythmia and originates from the left side of the atrium, the left atrium, as opposed to the atrial flutter circuit, which originates from the right side of the heart. Okay, I have another question from the Internet while we're waiting to set up our connections there. The next question is from a patient who periodically goes into atrial fibrillation, who's been cardioverted in the past and currently on Rhythmol. The question is whether the atrial fibrillation ablation would benefit this patient from atrial fibrillation. Now, again the patients that most benefit from ablation of atrial fibrillation are patients who have what's called lone atrial fibrillation. They don't have other structural heart disease. They, in general, don't have enlarged hearts or leaky valves. And those patients who have failed antirhythmic therapy and have frequent symptoms are patients that would be in general good candidates for ablation from the atrial fibrillation. In general, for atrial flutter, the arrhythmia we are treating today, we can cure this roughly 90 percent of the time. Atrial fibrillation, the cure rate right now is not as high, probably about 70 percent or so, and it's a more aggressive procedure.

As technology advances, though, I suspect the cure rate for atrial fibrillation from ablation, with ablation will be much higher.
00:21:55
ALBERTO INTERIAN, MD: Okay, you know, we've got all our bugs worked out and we got everything calibrated and everything else and I'm trying to localize the area where I want to burn. That's what I'm doing right now.
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PETER V. GARCIA, MD: Fluoro image? Let's look at the fluoro image now. You can see the catheter for the ablation to the right side of the screen, pointing down and what Dr. Interian did was correlate the 3D mapping image with the fluoroscopy image and now that he's started the ablation procedure, we can look at the 3D image and you'll see the view on the left of the 3D image screen. If we can move over there, you can see that little red dot next to the tip of the white catheter with the green tip. That's the first ablation point that's been made. What Dr. Interian's going to do is he's going to create a linear burn, a little line, from the tricuspid valve back to the IVC to get rid of this atrial flutter circuit. The atrial flutter circuit is actually a loop, makes an electrical loop through the right atrium, and we're going to take out part of that loop with the ablation procedure.
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ALBERTO INTERIAN, MD: Peter, what we're actually doing, we have an electrical circuit and we're going to be throwing a little barrier in there by our burn, so we're going to create a little barrier by burning right across that small area where the flutter occurs and then interrupt the circuit. So, it's basically like taking a pair of pliers and cutting an electrical wire. Once you've cut it, the electricity can't go across and you can't have that short circuit. I'm going to be dragging this catheter and you'll see more red dots, red dots. I'll burn for about 40, 45 seconds and then move back slowly until, hopefully, we'll create a successful line.
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PETER V. GARCIA, MD: Now, I'm sure some of the viewers would be interested to know, if the patient's feeling anything at this point or how much discomfort do they have during the procedure?
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ALBERTO INTERIAN, MD: I think, you know, it's an individual thing. I think some patients have a little more discomfort, others less. You know, particularly with a saline-irrigated, it doesn't let the temperature, the charring, and it goes – it's a little less discomfort. Certainly, they may feel a little burning.
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PETER V. GARCIA, MD: Now, without the saline tip catheters, sometimes we achieve temperatures up to 70 degrees Celsius, but right here from our monitors, we're about 38 to 40 degrees Celsius, so again as Dr. Interian mentioned, this prevents char formation and less discomfort in general to the patient during the procedure. As you can see again on the 3D images, we've now – there have been several points that have received radio frequency ablation energy there. You can see them by the red points. What we're going to do is again create that linear lesion back to the inferior vena cava, to get rid of this arrhythmia.
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ALBERTO INTERIAN, MD: We try to make our patients as comfortable as possible, but at the same time, we don't like to put them down to a point where they require intubation and can't breathe on their own. So we try to make them comfortable with sedation, but we like to be able to communicate with them as we need to.
00:26:06
PETER V. GARCIA, MD: Now, if you want to pan over to the EKG images, here on the EKG images you can see in the blue colors at the top of the EKG images, that's the

electrical activation in the atrium of the heart. The patient's atrium is beating approximately 300 beats per minute and once we completely burn the circuit that causes arrhythmia, you'll see that the frequency of the atrial electrical activation decreases significantly. So most of the time, during the procedure, we'll see a termination of the arrhythmia as we deliver the ablation energy. Okay, we want to look back to the 3D images again. You can see a few more radio frequency burns have been delivered there. Now if we go to the fluoroscopy images, the x-ray images, you can see on the x-ray image the ablation catheter with the thick tip at the bottom of the heart is actually moving back toward the left side of the screen, so it's moving across the base of the right atrium, by our x-ray image. Before these 3D mapping systems were used, we would have to use fluoroscopy throughout the procedure, so the patients would receive considerably more radiation from the x-ray images, which we have to continuously monitor. As we mentioned, one of the major benefits of using these three-dimensional computerized systems, less radiologic exposure to the patient.
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ALBERTO INTERIAN, MD: One more thing, Peter, the other thing that helps us is it tells us where we burn and where we've been so we can see the dots where they're at. If we need to fill in the gaps in between, it's also very helpful in that sense.
00:28:07
PETER V. GARCIA, MD: Exactly. Some patients have very thickened heart muscle and we have to do more than one burn in the same area and the 3D mapping image, as you can see, allows us to go right back to those red points and deliver further burns to get rid of the atrial tissue in those areas in thickened hearts. Now, Al, why don't we give them a rough idea how long the procedures take in general and how that's evolved over time with the new technology?
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ALBERTO INTERIAN, MD: Well, you know, I think in the past we used to do these ablations with normal catheters and that took a little longer because we didn't have the penetration capability that we have with these saline-irrigated catheters. So, they'd take longer, as you know. Now, with these saline-irrigated catheters, it'll take a little longer. You know, the technology's developed tremendously. It originally started with the catheters being the extension of a cautery unit, that is a surgical piece that is used in the OR. We used to connect a homemade catheter to these cautery units and basically cauterize, in a sense, through the catheter. Then, things got more sophisticated and we found that – and actually when I first started doing this, the first case I did was using an old Valley Lab cautery unit. This was probably over 20 years ago, with an in-line ohmmeter from Radio Shack that we used to use to measure the impedance or the inverse of the resistance, and if the resistance or impedance went up, we knew we had charring at the tip. Catheters were handmade and we used them multiple times. We really only had one catheter, and as things became more sophisticated, they put temperature sensors at the tip, two types have been developed, thermistor and thermocouple. So, they actually have a sensing loop, which adjusts the energy or the actual that is being given to the tip to maintain a temperature that is not higher than 70 degrees centigrade, or Celsius, and the reason they use that is because above 70 degrees you get boiling and more charring is used. So, 70 has been found to be the ideal temperature. Between 60 and 70 degrees Celsius has been found to be the ideal temperature to deliver an effective lesion and not obtain charring of the tissue at the tip. Now, with these saline-irrigated catheters, all that went out of style because what happens is that they really use the water, the water coming in contact, the saline, in other words, which is heparinized, come in contact with the endocardium of that area between the tricuspid annulus and the inferior vena cava to heat it up. So, this technology allows

that freedom of having no charring, being able to burn longer and achieve penetration.
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PETER V. GARCIA, MD: So, basically, advances in the catheters, advances in the ablation equipment, have allowed us to take this procedure from being often, not so far long ago as five, six years ago, from being a four to five hour procedure, to in general roughly an hour procedure.
00:32:46
ALBERTO INTERIAN, MD: Hopefully. We've only got an hour, so hopefully that's all it will take, but you're right. It really allows us to shorten the procedure. You've got to remember, the healthier the heart, the more muscle is there, the longer it takes because you have to be able to penetrate deeper. In sicker patients, with thinner muscle, it's easier.
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PETER V. GARCIA, MD: Now, it's also important to note, all these procedures we perform routinely, the risk of complications dramatically decrease by shortening the time of the procedure and again a benefit for the patients, less risk for the patients. You can see on the 3D images now that Dr. Interian's doing some more burns, a little bit closer to the coronary sinus. The coronary sinus sometimes is intricately involved in atrial flutter and he's connecting that line of dots with the previous line of dots to create a more definitive ablation lesion for this patient. Okay, for those of you who have just joined us, we're here at the Mercy Arrhythmia Syncope Center performing electrophysiology study and three-dimensional mapping and ablation of atrial flutter. Dr. Interian right now is performing the procedure to hopefully cure this patient of this arrhythmia. Again, for those who just joined us, we're using our three-dimensional mapping system, which allows us to locate the electrical circuits causing this arrhythmia and create linear burns or ablation lesions to permanently cure this arrhythmia.
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ALBERTO INTERIAN, MD: Any questions so far, Peter, from the audience?
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PETER V. GARCIA, MD: We've had a couple on atrial fibrillation, which I went over but you want to let the patients know typically after the procedure what type of restrictions and how soon they can get back to work, back to their normal activities?
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ALBERTO INTERIAN, MD: As you know, Peter, a lot of the restriction on these patients has to do with the puncture wounds in the groin. Most of these patients have to go back on blood thinners for at least four to six weeks, because of the initial threat of clot formation that still exists when the ablation is first done. So, some of the problems that we have, and we've sort of been pretty good about doing that, is that these patients tend to – We tend to tell them to really take it easy for a few days and then after three or four days, they can pretty much, if their groins look good, don't have any hematomas or bruises in their groin, they might pretty much go up to normal activity. A lot of times we perform this procedure as an outpatient procedure. Patient comes in the same day – comes in and is discharged the same day. The heart is really not the main problem here.
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PETER V. GARCIA, MD: As you can see, when we were looking over at the actual field of the procedure, you see the wires going in through the little sheaths, the white sheaths in the groin, and those tiny punctures we make to get the wires up into the heart really don't require any sutures. With a little pressure after the procedure, those little puncture marks seal, so again the next day the patients can do limited walking and five days of no heavy bending or straining. If they are in an

exercise program, probably a week or so before they start. But in general again, they patients can often go home if they don't require anticoagulation with blood thinners immediately after the procedure. You can see there from the screen, Dr. Interian is manipulating the catheter with his hands. The catheter on the distal end of the catheter that's in his right hand actually has a little plunger, and when he moves that plunger it moves the catheter within the heart. By fine manipulations of the catheter, he can move the catheter through the heart while watching the images, the 3D images, on the heart to know exactly where he's moving that catheter. There on the fluoro image again, you can see that ablation catheter to the bottom of the screen. It's now in the middle of the screen, as he's moving it back across the atrium, and if we go up to the 3D image again, you can see that there's more red little spots where ablation energy has been delivered. Again, you can see, as we mentioned, he's creating a little line of ablation points, two little lines there, and these lines are going to try to transect the electrical circuit in the atrium of the heart. Okay. You can see as he's moving the catheter again, for those of you who just joined us recently, the catheter that's actually delivering the energy is the white catheter with the green tip.
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ALBERTO INTERIAN, MD: That's a little more stubborn than usual, huh, Peter?
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PETER V. GARCIA, MD: Yeah, you know, this patient, as you can see from the fluoroscopy, his heart's enlarged so the actual lesion that you have to create is probably a little bit bigger than in general.
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ALBERTO INTERIAN, MD: A little wider. A little wider than more common. Well, you know, he's got hypertension, his muscle is thickened. His heart's a little bit enlarged, so that's to be expected.
00:39:20
PETER V. GARCIA, MD: Okay. Well, we have a few more questions that come through the Internet for us. One of them is, "How many days are required to stay in the hospital?" I think we answered that one. From the ablation procedure itself, it's really an outpatient procedure, so from the procedure itself, patients in general can go home the same day. The ones that we do keep in the hospital for a couple days are those who we have to restart their blood thinners, the Coumadin and – The Coumadin actually takes a couple days, sometimes a little more before until it takes effect, so sometimes we have to put those patients in the hospital for intravenous blood thinners. Now, I know, Al, you're interested in preventive medicine. There's a questions here, "What's the most effective type of preventive medicine to prevent arrhythmias?"
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ALBERTO INTERIAN, MD: Well, I think the answer's very clearly, Arrhythmias come most of the time secondary unless they're congenital, secondary to things that affect the heart. In this case, it was hypertension, but diabetes, heart attacks, etc. So, the best preventive measure for acquired arrhythmias, which account for the majority of them, is good heart health. When I mean good heart health, I mean good blood pressure control, eating right, controlling your cholesterol, avoiding anything that's going to damage your heart.
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PETER V. GARCIA, MD: Another questions, too, from one of the viewers is, the question is, "Is the pacemaker actually causing this arrhythmia?"
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ALBERTO INTERIAN, MD: Absolutely not. The pacemakers only wires are just getting in my way and making the procedure a little more tedious, but the pacemaker is

used for slow heart rate and in this case, what he has is a very fast heart rate in the top part of his heart.
00:41:12
PETER V. GARCIA, MD: And it's important to point out, a lot of patients with these rapid arrhythmias, or atrial arrhythmias, also tend to get slow heart rhythms when they're in normal rhythm. So, this syndrome is called "tachy-brady syndrome", rapid arrhythmias with the normal heart rate being slower than usual. Basically it's signs that the heart's own pacemaker function is kind of awry, and that's why we often see patients with atrial flutter, atrial fibrillation, requiring pacemakers. Now that's a little different than needing a pacemaker as a complication of the procedure. There's another question, if you want to take it, Al, "What is the risk of heart block or requiring a pacemaker as a complication of the procedure?"
00:42:00
ALBERTO INTERIAN, MD: The incidence is very low because you're really burning away from the area where the main conduction system or the main electrical wiring of the heart is. But, in patients like him that come in in flutter, we don't know what his normal rhythm is underneath this, so once we get rid of the flutter we are hoping that his own natural pacemaker kicks in. His case doesn't make any difference because he has an artificial pacemaker in. But in patients that do not have a pacemaker in, we hope that their own natural pacemaker starts acting up and kicking in and pacing, because it's being suppressed by the constant atrial fibrillation, or atrial flutter. So if it doesn't – we tend to wait a little bit – if it doesn't, then the patient would have to have an artificial pacemaker placed. It's a rare incidence. It's the exception by far, not the norm.
00:42:59
PETER V. GARCIA, MD: Now we're back to the 3D images. You can see again, Dr. Interian is delivering more pulses to some of the areas where he already delivered energy. By looking at the electrocardiograms from his catheter, he's still noting that there's still electrical energy traveling through the areas where he's already delivered some of the radio frequency ablation pulses. So that's indicating this patient, as we mentioned, seems to have thickened heart muscle in the area of the atrial flutter circuit. So he's going to go back to those areas and locate any tissue in the atrium that's still conducting electrical energy and deliver more radio frequency pulses to get rid of that electrical conduction in those areas. Again, looking at what we call the intracardiacs in the EKG screen, the yellow line there is the electrical signal he gets from his ablation catheter and before delivering the radio frequency pulses, he looks at that catheter to see if there's still electrical energy traveling through the area where the catheter is. That's how he guides where he needs to deliver more radio frequency pulses. We can go back again to the 3D images so you can keep an eye on how he's moving the catheter. Another question's come through, maybe a good one for you. The viewer's asking, "Should this procedure be performed in smaller hospitals with less experience electrophysiologists?"
00:44:43
ALBERTO INTERIAN, MD: Well, you know, it's an interesting question. It's like any other procedure or any other surgery. I think centers of excellence that do this routinely can deal with aberrant situations or more difficult situations than your smaller community centers. So, like any other highly specialized procedure or operation, the operators that have the most experience are usually the ones who are more successful and have the least complications.
00:45:34
PETER V. GARCIA, MD: Now again, you can see the catheter moving. He's moving the catheter further out towards the ventricle and he's moving the catheter along the line of red dots, looking for areas of persistent electrical energy that may be causing

this arrhythmia to persist. Here we are, back to the fluoro so you can see how that correlates with the actual x-ray images in the heart and the discrimination of point-to-point on the 3D mapping is within two to three millimeters in general, so it's a very precise location from the 3D mapping. So you can see that he doesn't go very often to the fluoroscopy images because we know that our computer images are very precise, so we don't have to expose ourselves or the a patient to any excess of radiation for this procedure.
00:46:49
ALBERTO INTERIAN, MD: It's a little stubborn. I think it must be one little fiber in one of these areas that it's breaking through and it's maintaining the circuit.
00:47:03
PETER V. GARCIA, MD: So again, what Dr. Interian is doing is just searching for areas of breakthrough of electrical energy where there's atrial tissue that's still conducting electrical energy. The atrium in that area is not smooth and flat. There's often little divots, or crevices, or trabeculations in the atrium, and in these little depth crevices or little trabeculations, often you can get atrial tissue that continues to conduct the electrical circuit. So often it's a very small part of the atrium, couple millimeters or so, that actually allows this arrhythmia to persist. Now with the 3D images, we can use other techniques also. Right now, we're basically using it anatomically to locate where we're going to place the burns. If this patient's arrhythmia doesn't terminate when we've delivered enough burns to get rid of the atrial tissue, what we can do is an activation map. We can electrically look at the activation and construct an activation map, which shows us how the electrical activation of the heart proceeds over this area of the heart and it helps us identify the breakthrough point where this arrhythmia still is persisting through, and sometimes we can see breakthrough points in unusual areas. One of the most common, wouldn't you say, is the coronary sinus?
00:48:45
ALBERTO INTERIAN, MD: Yeah. Yeah, absolutely. It's a structure sitting right next to it. It's like a tube a lot of time a circuit just goes around it or into it and causes that breakthrough. You're absolutely right.
00:49:00
PETER V. GARCIA, MD: I think you published – Didn't you publish , if I'm not correct – if I'm not wrong, a few years ago, a paper about it?
00:49:07
ALBERTO INTERIAN, MD: It has been a few years. It was in the late 80s.
00:49:10
PETER V. GARCIA, MD: About breakthrough points in coronary science.
00:49:12
ALBERTO INTERIAN, MD: Exactly, and the circuit and the septum, the septum being part of the circuit in atrial flutter.
00:49:21
PETER V. GARCIA, MD: So, still we're going to – he's going to finish up the line on the initial lines that you can see, and if there's still persistent arrhythmia after that, probably we're going to look into the coronary sinus, the ost of the coronary sinus, the opening of the coronary sinus, to see if there's electrical activation transcribing through there, proceeding through there. Now again, on the 3D image, you can see the catheter with the green tip is up towards the right hand side, upper part of the screen, and he's going closer to the coronary sinus. You can see the orange catheter there on the left image. That's the catheter in the coronary sinus, so he's getting right up close to that catheter to see if he can terminate the arrhythmia in that area. Now, since we're talking a little bit about how the technology's evolving, do you have

anything you want to let the patients know about what we expect in the future for these procedures, for the catheters maybe?
00:51:07
ALBERTO INTERIAN, MD: I think in the future we are getting catheters that – and newer energies also. Radio frequency will not be our primary energy. We are going to have catheters that actually freeze the area. We have catheters that will be using microwaves to cause lesions. Those are being experimentally now, being used in the operating room from the outside of the heart. There are high frequency ultrasound catheters. Again, the clinical trials are being used in the surgical suites for similar arrhythmias on patients that are having open-heart surgery. So, certainly better catheters, different technology. I think the future to this is navigation, mapping systems, and I think more and more we're going to be getting better systems.
00:52:16
PETER V. GARCIA, MD: Okay, you can see we've gone back to the fluoro images so we can correlate again where we are under x-ray, comparing it to our 3D images. You can see, the catheter, he's moved it further out by that coronary sinus catheter.
00:52:28
ALBERTO INTERIAN, MD: Give me a little more gain, Ernie, in the mapping please. What I'm telling my tech in the x-ray booth is to increase the gain a little bit so I can see the images, the electrical signals. And the mapping, can you increase the gain a little bit? Scott? Is doing it? Huh? He's what?
00:53:19
PETER V. GARCIA, MD: Okay, we have another – let's take another question here, if you want. There's a patient asking, he's using Tikosyn for the treatment of lone atrial fibrillation after other medications have failed and it's been working for two weeks after cardioversion. The question is if his arrhythmia recurs, would he benefit from undergoing an ablation for atrial fibrillation at this point in time, or maybe waiting a couple years down the road until the technology improves a bit further? That's kind of a – That's an important point. The way atrial fibrillation is ablated now, compared to the way it was ablated four or five years ago, is much different. The techniques and the equipment we use is much different. Again, atrial fibrillation comes from the left side of the heart, around the pulmonary veins. It's a more aggressive ablation, so the risks are a little bit higher, and the cure rate right now is less than many of the other types of ablation, roughly about 70 percent. But as time progresses, also, with atrial fibrillation ablation, the cure rates will more than likely increase. Again, I think the main point for ablation of atrial fibrillation is the patients that really benefit from this ablation are those patients with lone atrial fibrillation. They don't have what we'd term structural heart disease. They don't have leakage of the valves. They don't have enlarged chambers of the valves. And they don't have other diseases, for instance, hypertension and diabetes, that may cause scarring in the atrium and cause atrial fibrillation that's really not lone atrial fibrillation. Okay, we can see from the 3D images – Now the images on the screen have been rotated a little bit to give a different view. We've gone on the left side of the three-dimensional image from an LAO/caudal, looking from below and the left of the heart, to more of a straight LAO image, and the right side of the heart – the right image on the screen is still showing us an AP image, but sometimes we rotate the image to get a little better look of these more difficult areas.
00:56:03
ALBERTO INTERIAN, MD: Right now, I'm going to go to an RAO 30, give me a better look at it.
00:56:18
PETER V. GARCIA, MD: On fluoro, you can see the catheter, the ablation catheter, towards the bottom of the screen, and below the other catheters there. Right above

it is that coronary sinus catheter that's going behind the left atrium. It's actually projecting away from us. Okay, you can see from the fluoroscopy images how the catheter's being moved, and if we go back to the 3D images, you can see that he's starting another line through a different area of the atrium, the base of the atrium there, and he's getting rid of electrical activation in this line. Again, as we mentioned, some of these enlarged hearts, there can be different areas where the electrical energy is passing through and allowing this arrhythmia to persist.
00:57:33
ALBERTO INTERIAN, MD: --right anterior oblique, abbreviated RAO, to try to get another line, again to throw a different monkey wrench into the circuit.
00:58:00
PETER V. GARCIA, MD: You can see there on the 3D images, the image to the left, he's starting a new line with the red dots and he's going to bring it down through the atrium and connect on the back end of the other lines with the red dots. Basically, again, trying to short-circuit this arrhythmia.
00:58:35
ALBERTO INTERIAN, MD: Not yet, we've got a few minutes. How's he doing, Scott? Blood pressure and everything okay? Good. Saturation okay?
00:59:35
PETER V. GARCIA, MD: As you can see throughout the procedure, Scott, our nurse up there is in close contact with the patient. If he's having any discomfort, we give him more sedation. Also the oxygen levels, the blood pressure is being continuously monitored. So again, a big benefit to avoiding general anesthesia in these procedures. You can see now, he's delivered multiple burns on this new linear lesion on the left screen there and 3D images. It's going to come down and connect to the other lesions that he's created, the other linear burns that he's created.
01:01:18
ALBERTO INTERIAN, MD: Yeah. Ernie? Go ahead. We do it -- You've got to put the wattage back on. We had a little jump in the resistant – Put on 35.
01:01:37
PETER V. GARCIA, MD: I don't know if you want to go back a little bit in history. I remember when I was training and I trained under Dr. Interian. The initial ablation equipment we used actually had rechargeable batteries in them.
01:01:52
ALBERTO INTERIAN, MD: Oh yeah. Yeah, I remember that. Also, there's something to be said for rechargeable batteries you can move it around all over the place, but boy, if you had a long case, battery died, you're dead. You had to have extra batteries, you're absolutely right, Peter. You want to put some gloves on? This is really a stubborn one.
01:02:25
PETER V. GARCIA, MD: I didn't want to mention anything, but I picked a tough patient for you today.
01:02:28
ALBERTO INTERIAN, MD: Yeah, I figured that.
01:02:58
PETER V. GARCIA, MD: Okay, if you want to go back to the 3D images, you can see the catheter is back further in the atrium and we're almost connected that new line of red dots with one of the previous lines of red dots. Then again, what Dr. Interian will do is go back over that other line and look for any more areas where the electrical circuit and the electrical energy is coming through. With the 3D images, if the arrhythmia persists in these more difficult cases, we can actually superimpose another electrical map on the heart to look for those breakthrough points. Again, the areas where the electrical energy is still traveling through the heart muscle, allowing

the arrhythmia to persist. So sometimes, we haven't done it so far, but often we go to these activation maps when we get these stubborn cases, to really look for the breakthrough point of this arrhythmia. They clutter up the image a little bit, so right now we haven't gone to a secondary map. Again, for those of you watching, if you have any questions, just click on your screen and we'll be happy to try to answer your questions live. Alright, if we go now to the EKG images, and you'll see on the EKG images, the rhythm and the electrical activation in the atrium has significantly decreased. When the patient was in atrial flutter, the rate, the atrial rate was approximately 300 beats per minute. With that last lesion he delivered, the arrhythmia now has stopped.
01:05:13
ALBERTO INTERIAN, MD: And the patient is being paced. The pacemaker's pacing right now. So, we got it at the end.
01:05:20
PETER V. GARCIA, MD: If you want to go back to the 3D image, and you'll see on that second line, the yellow dot there. That's the successful point and you'll see it to the right image on the screen, too. That's the actual spot where this arrhythmia was breaking through, and with the burn in that area the arrhythmia terminated, and now the patient's heart is back in normal rhythm.
01:05:47
ALBERTO INTERIAN, MD: This was a …
01:05:50
PETER V. GARCIA, MD: It took about an hour, but compared to how long these procedures used to take.
01:05:55
ALBERTO INTERIAN, MD: It was a little nerve-racking. I was looking at that clock. I said, "Can I do it before that hour?" If you look at it – Peter, what you said was very nice. As soon as I tied the line, one line with the other, that's where it broke. All right, you want to pace the CS for me please. Excellent. Excellent.
01:06:14
PETER V. GARCIA, MD: Okay, if you look on the EKG screen now, the rate has picked up a little bit. You can see on the blue lines, that's the electrical activation in the atrium, and to the catheter in the atrium, we're actually pacing the atrium to confirm that we've gotten rid of the electrical activation that's causing this circuit. Now, by fluoroscopy, if we want to go there, Dr. Interian's repositioning the right atrial catheter to get a better look at that atrial activation in the right atrium. So, basically to simplify a little bit what we're doing now is we're going to pace on both sides of that radio frequency ablation line to confirm that no electrical energy can pass through that area, and that's how we confirm a successful cure of the arrhythmia, besides terminating the arrhythmia.
01:07:10
ALBERTO INTERIAN, MD: Hey, you want to keep pacing a little bit?
01:07:18
PETER V. GARCIA, MD: You can see there on the EKG images, there's pacing, pacing is being performed from the left side of the heart to the coronary sinus catheter and we're looking at the way the electrical activation lines up to confirm that we've gotten rid of the circuit.
01:07:34
ALBERTO INTERIAN, MD: It's getting competition with the… Okay. This catheter's actually a little bit too big for him. Right? This catheter's actually to big for him.
01:08:15
PETER V. GARCIA, MD: Okay, if we want to go to the x-ray images, you can see the catheter in the left side of the image is the catheter in the atrium that he's moving.

01:08:22
ALBERTO INTERIAN, MD: Yeah, I'd like a block there. I made good. Normally then, in this case, we won't check the normal electrical system of the heart because the patient already has a pacemaker and it was determined in the past that his electrical system was not working well. So, in this case, the procedure's pretty much over. The pacemaker now is pacing his heart. The top part of his heart and the bottom part of his heart is working in synchrony. The patient's cardiac output is probably going to increase by 15, 20, to 25 percent, because that's the contribution that the contraction of the atrium does to your cardiac output. Peter, anything else that you want to add?
01:09:11
PETER V. GARCIA, MD: Yeah, another benefit is that down the road, sometimes these patients, we can even take them off blood thinner because when we cure the arrhythmia, the risk of developing blood clots from these arrhythmias obviously decreases significantly.
01:09:25
ALBERTO INTERIAN, MD: Excellent. Excellent. Well, I think I'd like to thank everybody for joining us from around globe, Latin America, Europe, United States. We hope that this visit into our arrhythmia center is of educational value. This is going to be one of more transmissions that we'll do in the future, as we, the interventional electrophysiologists tackle other forms of cardiac arrhythmias, we will bring them to you via the web. Thank you very much for being with us. Peter, thank you for narrating. Scott, Cindy, great job. Asta la vista.
01:10:15
PETER V. GARCIA, MD: Thank you and have a good evening. Good job.
01:10:25
ANNOUNCER: This has been an electrophysiological study in catheter ablation, with 3D mapping, performed from Mercy Hospital in Miami, Florida. OR-Live makes it easy for you to learn more. Just click on the "Request Information" button on your webcast screen and open the door to informed medical care.
01:11:04
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