NARRATOR

Today, live, from Brigham and Women’s Hospital in Boston, Massachusetts, cardiologists will perform a catheter ablation procedure for atrial fibrillation. Atrial fibrillation affects over 2 million Americans. Though it is typically not life-threatening, it can create significant quality of life issues that can change the way the patient lives their day-to-day life, such as limiting physical activity because of fatigue or fear of damage to their heart or other cardiac event.

LAURENCE EPSTEIN, M.D.

Atrial fibrillation is, by far, the most common cardiac arrhythmia, or abnormal heart rhythm. It’s estimated that it affects well over 2 million people in this country presently and people are concerned that that’s going to increase dramatically, almost to the point of being an epidemic. We know that it can occur in any age; however, it is much more common in the elderly and everybody knows that the population continues to age dramatically, so there’s going to be a real increase in having to deal with this issue.

NARRATOR

The procedure will be performed by Dr. Laurence M. Epstein, Chief of the Cardiac Arrhythmia Service at Brigham and Women’s Hospital. Your host will be Dr. William G. Stevenson, Director of the Clinical Cardiac Electrophysiology Program at Brigham & Women’s Hospital. The procedure selectively eliminates the heart cells that are causing the irregular heartbeat through the use of radio frequency electrical energy delivered by the catheters that are positioned in the heart.

LAURENCE EPSTEIN, M.D.

Candidates for catheter ablation of atrial fibrillation are those patients who have symptomatic episodes. We found that the highest success rate occurs in those patients who have basically structurally normal hearts, or what’s called lone atrial fibrillation. However, we have had good success, even in patients with dilated left atrium. For those patients with persistent atrial fibrillation, again, we really want to limit our ablative approach to those who are symptomatic or have failed an anti-arrhythmic medication. We’ve had some success with extending the procedure and eliminating not only triggers, but also modifying the substrate.
Now, your host, Dr. William G. Stevenson.

WILLIAM STEVENSON, M.D.

Good afternoon and welcome to the Electrophysiology Laboratory at Brigham and Women’s Hospital. I’m Bill Stevenson, Director of the Clinical Cardiac Electrophysiology Training Program. To my right, through this glass, is Dr. Laurence Epstein, the Chief of the Cardiac Arrhythmia Service here. Thank you for joining our webcast on the catheter ablation procedure for atrial fibrillation.

Atrial fibrillation is characterized by chaotic atrial electrical activity, affecting the upper chambers of the heart. As you see on this graphic, we also recognize it from the electrocardiographic appearance of chaotic atrial electrical activity. Now, that’s due to chaotic wave fronts spiraling around the atrium. We’re going to be looking today at catheter recordings from directly within the atrium and you’ll see a lot of these kinds of tracings, portions of the atrium that have relatively organized activity with discrete electrograms and other areas with very fractionated atrial electrical activity, characteristic of atrial fibrillation. Now, of course this results in loss of atrial contraction and the attendant risks of thromboembolism and stroke, as well as decreased exercise capacity. Many patients are very symptomatic with their atrial fibrillation, although it’s not life-threatening. We are always confronted with the choice of do we attempt to restore and maintain sinus rhythm for a patient with atrial fibrillation or leave them in atrial fibrillation, control the heart rate, and administer anticoagulants to protect them from the risk of stroke? It’s been disappointing that medications for this purpose have been relatively poor in their efficacy and that has really fostered the developments of these nonpharmacologic therapies, such as the catheter ablation procedure that we’re going to be showing you today to try and maintain sinus rhythm for patients with atrial fibrillation.

At this point, let me introduce Larry Epstein, Chief of the Arrhythmia Service. Larry, how is the procedure going?

LAURENCE EPSTEIN, M.D.

Well, we’re all set here with the patient on the table. I’d like to welcome everybody for taking time out of their busy schedule and joining us. What we’ve done so far is prepped and draped the patient and gotten access into the vasculature. On this side, we have a 7 French sheath in the left femoral vein. On the other side, we have two long 8 French sheaths in the right femoral vein. Both of these sheaths are going to be used for transseptal punctures and we’ll talk about that a little bit more in a minute. Also we have an intracardiac echo catheter. We’ll take a look at the image on the intracardiac echo. You can see what this is is a catheter inside the heart that has an echotransducer, an ultrasound transducer, on the end. It’s kind of like a standard echo, but miniaturized, so
What’s going on here now is we’re recording from inside the heart and actually this catheter is positioned up in the superior vena cava.

What I’d like to do is introduce the folks that are going to be working with me here today. Over to my left is Dr. Azer, one of our EP fellows here. To my right is our team, including Deb, who is our x-ray tech; Frank, who is the EP tech; and Greg, who is our nurse for the procedure. What I’d like to do now is continue to get everything ready to go and let Bill talk a little bit more about the ablation, in general.

WILLIAM STEVENSON, M.D.

Well, thank you very much, Larry. Atrial fibrillation evolves through a series of stages, if you will. Often patients start as paroxysmal atrial fibrillation, where the fibrillation comes and goes intermittently. As the disease progresses, it’s not unusual for it to evolve to persistent atrial fibrillation. Once they’re in atrial fibrillation, they stay there unless we do an electrical cardioversion to restore sinus rhythm. Then finally, in the last stages of the problem, atrial fibrillation is permanent. Even if we do an electrical cardioversion, sinus rhythm cannot generally be maintained for any appreciable length of time. You can imagine, then, that the approach to ablation of atrial fibrillation may have to consider how severe the atrial disease is for these patients. When somebody has paroxysmal atrial fibrillation, often it’s sufficient to just find the triggers for the atrial fibrillation. What are those triggers? Well, they’re ectopic foci that are able to fire electrical signals rapidly and drive the heart into atrial fibrillation, so the focus of this procedure today is going to be on isolating those areas of the heart that are likely to contain those triggers, specifically the pulmonary veins. As atrial fibrillation progresses to the next stage and the substrate of the atria begins to support re-entrant activity in a more stable way, then the ablation procedure needs to consider that and to involve a bit more ablation to try and prevent those re-entrant arrhythmias. That’s also the case once atrial fibrillation becomes permanent. You can also imagine that the efficacy of the procedure decreases with the severity of the underlying atrial disease as one progresses from these stages, from persistent to permanent atrial fibrillation.

Now, we’re going to be focusing on the pulmonary veins for the first part of this demonstration today. On this graphic, you see the heart from the posterior view, with the left superior pulmonary vein here, left inferior pulmonary vein here, right superior and right inferior veins. You can appreciate that there are sleeves of myocardium that extend out along these veins. These likely contain the triggers for the fibrillation. Now, this approach of segmental pulmonary vein isolation was initially developed and described by Michel Haissaguerre and it has evolved through a bit more of an anatomic approach. Larry’s going to show you how we do that, using ultrasound to carefully guide placement of the RF lesions, largely on an anatomic basis to essentially isolate those veins.

Our patient today is a 41-year-old gentleman who has a history of hypertension. He has no other structural heart disease, but he has had episodes of symptomatic atrial fibrillation with palpitations for more than 12 years. He has failed anti-arrhythmic drug therapy with beta blockers and Sotalol. In preparation for the procedure, he had a cardiac MRI
evaluation to define pulmonary vein anatomy and you see that here. Again, this is a PA projection, similar to that which you saw a moment ago. You see here the left superior and left inferior pulmonary veins. In this case, they are separate veins with separate ostia, the right superior and right inferior pulmonary veins, as you see in this graphic.

Larry, how are we coming?

LAURENCE EPSTEIN, M.D.

I think we’re ready to get to the transseptal. I had mentioned earlier that we are using this intracardiac echo catheter. I have one inside the patient now, but I also wanted to show you what it looked like. Essentially, it’s a miniaturized version of an echo probe. On the tip of the catheter, here, you can see the ultrasound transducer that spins around very rapidly and emits and then receives the ultrasound signals to give you the image, so if we go to the AP fluoroscopy screen here, what you can see is we have some catheters already in the heart. So we have the ultrasound catheter, which is the one dark tube that’s kind of going up the middle. We have another sheath that doesn’t have anything in it, that’s kind of coming out of the top of the screen. Then we have another decapole catheter, so that’s a catheter that has 10 electrodes on it and that’s positioned within the coronary sinus. What that allows us to do, then, is to record and pace along the AV groove from the left atrium itself, without entering the left atrium with that catheter. I can also show you the lateral flow image here now. This is what that looks like in the lateral view, heading posterior.

Now, we have the ultrasound catheter positioned up in the superior vena cava, so if we stay on the ultrasound image, what I’d like to do is give you a little tour of the right side of the heart anatomy, so I’m going to slowly pull the ultrasound catheter back into the heart, so here we go. I’m coming down slowly. Here you can see the right atrial junction with the superior vena cava. On the inferior part of the screen, you can see kind of that trabeculated area. That’s actually the right atrial appendage. I’m going to come down a little bit further and now, probably at about 4:00 or 5:00, you can see that kind of ridge that’s coming in and out. That big ridge is known as the crista terminalis. That’s a very large fibrous muscle band that runs down the lateral wall of the right atrium and is important because it can be the origin of some arrhythmias. I’m going to come down a little bit further and you can see the right atrium is now opening up a little bit more. As I come down, you can see at the top of the screen, probably at around 11:00, the motion there, it almost looks like a Mercedes Benz sign. What that is is the aortic valve, which has come into view very nicely, so we can see in this view we’re in the right atrium and you can see the relation of the aortic valve in the actual left ventricle to the right side of the heart.

I’m going to pull down a little bit further now. To the left of the screen, you can see a valve opening and closing. Those are kind of those leaflets going back and forth. That’s the tricuspid valve on the right side of the heart, between the right atrium, where the catheter is, and the right ventricle. Now, if you look at the screen, you can see there’s kind of a bulls eye in the middle. That’s actually where the ultrasound catheter is and
you’re getting a 360° view around the ultrasound catheter. At around 3:30 or 4:00, you can still see that ridge sticking out on the wall there and that is the crista terminalis as it extends down the wall of the atrium.

I’m going to come down a little bit further now and now we can see it coming in and out of view as the fossa ovalis, so that’s almost at noon, maybe at 1:00, and it’s the thinning area of the intra-atrial septum that’s in between the right atrium and the left atrium. That’s going to be the target of our transseptal catheterization.

At this point I think I’m going to leave the ultrasound catheter in this position here and then we can go ahead and proceed with the transseptal catheterization. So what we have is a sheath. If we go to the AP fluoro view, there’s a sheath that I’ve positioned high up in the superior vena cava and that’s the first sheath that we’re going to do the transseptal with.

I’m going to come over here to the table and grab our transseptal needle. I don’t know if you can zoom in on that. So this is a sharp, hollow needle that has almost a 90° turn on it that’s going to allow us to go through the wall between the atria and get from the right atrium to the left atrium. So I’m going to insert this into the sheath, carefully, and then look on the AP fluoro and watch it go up into the heart and into the sheath. You can see it’s pretty stiff, so it twists the sheath around. Then what we’re going to do is take a manifold that’s attached to both fluid and to contrast. Now, people do this procedure very differently and there’s really not one right way to do it. Some people use pressure monitoring to tell where they are in the heart. I actually like using contrast staining as a method to try and determine where I am, so if we go to the AP view again, see, I’m going to turn the catheter around to face posteriorly. Then if we go to the lateral view, I’m going to withdraw this catheter down toward the fossa, so I’m coming down the wall. It makes its first jump over the aortic knob. I’m going to look at the AP view real quick and back to the lateral view. You can see right there, it just took a nice jump. Now, if we go to the ultrasound image, you can see that I’m tenting the wall, probably at around 1:00, tenting the fossa, with the needle right up against the fossa there. Now, if we go to the lateral view again, I’m going to advance the needle a little bit while I’m tenting the fossa and inject contrast there. It looks like we’ve actually popped across just when I advanced the needle. Go ahead and inject some more. See the contrast free in the left atrium? Great.

So now I’m going to advance the dilator over the needle and then I’m going to advance the sheath over the dilator into the left atrium. If you notice on that lateral view, the sheath has actually gone outside of the heart border. That’s okay. That means it’s extended out into one of the pulmonary veins already and now it flipped back into the atrium.

What you have to do now is be very careful that you don’t induce any air into the system because you can get what’s called an air embolus, so what I do is I take this manifold and I hook it up to the sheath and flush it through and then we’re going to withdraw and make sure there’s no air in the system. It’s nice and bright red because we’re in the left side of the heart, the oxygenated heart. Then I’m going to put full through.
Now I’m going to take our ablation catheter, which is right here, and put that up into the heart. I don’t know if you can see this or not. It’s a flexible catheter that has platinum electrodes on the tip of it. I’m just going to insert this into this sheath. Again, if you can go to the lateral fluoro screen, you can see that we’re going to come up the sheath that’s in the left atrium, right there. Now we have a sheath in the left atrium and it looks like it’s done us a favor and gone right out the left superior pulmonary vein. I’m going to hook that up.

Okay, so that’s the first transseptal. Now we have to get over with a second transseptal catheter so we can have the ultrasound in as well. What I’m going to do is get some contrast drawn up so we can do it again. Now I’m going to remove the ultrasound catheter because that’s the sheath that I’m going to be using, so if you come off the ultrasound, you can see here, I’m going to take this out and we’ll be going back in with this to the left atrium as well. I’m just going to tuck it under here for now and we’ll flush this sheath.

WILLIAM STEVENSON, M.D.

We already have an email question. I want to remind the viewers that, in fact, you can log on to livesurgery@partners.org and send us questions which we will answer throughout the telecast, as well as afterwards by email. The first one is how long is this procedure, generally?

LAURENCE EPSTEIN, M.D.

Well, it depends what you’re doing. The ultrasound-guided pulmonary vein ablation, on average, I’ve been able to do in about an hour and a half to two hours. So we’re going to try to get through as much of it as we can today. Some of the more extensive ablation procedures, where we’re trying to modify the substrate, actually can take significantly longer.

WILLIAM STEVENSON, M.D.

We’ll be showing one of those a little bit later on. We have another question that wants to know the overall success and we’ll deal with that a little later in the program as well.

LAURENCE EPSTEIN, M.D.

Okay. So we have the catheters in the heart and it’s causing a little bit of ectopy, but that’s okay. Now if we go to the AP fluoro, I’m advancing this second sheath up into the superior vena cava.

WILLIAM STEVENSON, M.D.
I also want to remind viewers that CME credit is available for physicians. There’s a CME button on the website that you can click on to engage that.

LAURENCE EPSTEIN, M.D.

So what happens sometimes is that the transseptal needle straightens out a little bit. Often you need to put a little more of that right angle bend on it to get back where you want to go. So again we’re going to do the exact same procedure this time, but it’s usually a little bit easier in that you have the guidance of the first sheath that’s gone across the septum.

WILLIAM STEVENSON, M.D.

We have another question. How long is the recovery period and length of stay in the hospital after the procedure? Most patients usually stay overnight for observation and go home the following day.

LAURENCE EPSTEIN, M.D.

We go to the AP fluoro now. You can see the second sheath is in the heart. I’m going to spin it around like I did the first one. In the lateral view now, we’re going to kind of walk down the septum and hopefully get it to drop in with the other sheath. So that wouldn’t be the place we want to go. I’m going to spin it around, though.

WILLIAM STEVENSON, M.D.

Another question. Do we distinguish between paroxysmal and atrial fibrillations in terms of assessing acute and chronic success? The success rates are different for those different severities of atrial fibrillation. A success rate for somebody who has got permanent atrial fibrillation may actually be simply reducing the episodes of fibrillation to where they have an occasional paroxysmal episode. That may be quite an improvement in that patient’s quality of life.

LAURENCE EPSTEIN, M.D.

So now we’re on the AP image here. Sometimes the hearts aren’t that big in some of these patients and the sheaths kind of get stuck on each other. We want to make sure we’re in the right spot when we do this. I’m going to inject some contrast now. You can see some staining of the wall there, up against the septum.

WILLIAM STEVENSON, M.D.

Another question. Is there a relationship between exercise and atrial fibrillation and is this procedure effective for patients with exercise-induced atrial fibrillation? Of course, our first therapy for any exercise-induced arrhythmia is a trial of a beta blocker, but many people do fail those. Their triggers around the pulmonary veins often are sensitive to
synthetic stimulation and catheter ablation that targets these foci around the veins certainly can be effective for exercise-induced atrial fibrillation.

LAURENCE EPSTEIN, M.D.

Bill, if can interrupt you for a second. We now have the second transseptal done and I’m going to put the ultrasound catheter. Can you show me the AP camera? I’m going to advance the ultrasound up into the heart and then turn it back on. If we go to the image, what you can see here are actually, if you go to the ultrasound view, both the ablation catheter and the ultrasound catheter are now actually out the left superior pulmonary vein. If we go to the lateral view now, you can see the two catheters heading out of the heart here, so if I go out a little further, you can see the vein narrows down. If you look at the ultrasound image, you can see I’m way out in the vein here. What I’m going to do is slowly pull back toward the os of the vein, where it meets the atrium, which is right there, so that os, that junction between the atrium and the ventricle, is our target.

I think what’s important to realize is that we are doing a focal ablation here today. This is a procedure that’s under evolution and there are different approaches to this. Probably the approaches that we’re using today, we probably won’t even be using in a couple of years. It’s my feeling and our feeling here that in patients that truly have structurally normal hearts in paroxysmal atrial fibrillation, that perhaps the best approach is to just do as little as possible, so if we can simply eliminate these triggers and they’re cured, then we’ve done as little ablating as need be. However, in patients with persistent or chronic atrial fibrillation, clearly eliminating the triggers alone isn’t enough in that you need to eliminate substrate as well, so I think for this patient today, the idea is let’s try and do as little as possible, isolate the pulmonary veins. We’ll do an additional lesion that we’ll talk about between the inferior pulmonary vein and the mitral annulus. We’ll do a right-sided flutter lesion and then we’ll go ahead and be done and see how he does. This is going to contrast a procedure that we’ll show you, that Dr. Stevenson did a week or so ago, in somebody with persistent atrial fibrillation.

So what I’d like to do now is position the ablation catheter back toward the os here. You can see in a second, if we go to the lateral view, the artifact of the ablation catheter right within the vein there. Bill, if you can point out on the screen the signal that we’re recording from that distal ablation catheter there. Now, sometimes what you see is the atrium, which is a big structure, so it generates a fair amount of electrical signals. What we want to do is try and separate the signal that’s due to the pulmonary vein musculature and the signal that’s due to the musculature of the atrium, so one of the things we can do is called differential pacing. Bill, if you can pace from the coronary sinus, which is pacing from the left atrium, you can see how that signal becomes much more fractionated, where the early part is due to the left atrium and the later, fractionated part is due to the signal from the pulmonary vein. If we go to the review screen, maybe you can point that out when it’s not flying by. There it goes right there.

So what I’m going to do now, to start, is just position the ablation catheter right at the os of the vein there. If we go to the ultrasound image, you can see very clearly that fan-
shaped artifact that’s heading off to about probably around 11:00 there. That represents the big platinum electrode on the end of the catheter, so what we’d like to do now is (1) first see if we can pace from within the vein, so let’s stop pacing from the coronary sinus. If we show the lateral fluoro view now, I’m going to advance the ablation catheter further out into the vein, right here. Bill, if you can pace from here, from the ablation, you can see with pacing within the vein, the musculature allows conduction of electricity back into the left atrium, so we’re seeing left atrial activation. If we come off pacing now, what the goal is, at the end of trying to isolate this vein, is to make sure that we have no electrical capture of the atrium when we’re pacing from within the vein, so now I’m going to reposition the catheter back toward the os, right at the junction of the atrium and the os, and you’re going to see, if we go to the ultrasound view, you can see now clearly there’s that fan-shaped artifact that’s right at that junction between the vein and the os. That’s where we’re going to start doing our ablation. Frank, if you can come on here, we ablate at 50° with 50 watt output. Now, often when we do ablation...we’re going to turn on radio frequency energy now. You can see the temperature, power, and impedance up on the right hand corner of the live EP screen. We can flip over to the EP screen so people can see that, the electrical signals, please. So now you’re seeing we’re getting to about a temperature of 48°. Now, when we ablate in other parts of the heart, we actually go higher than that. We achieve temperatures of 60 or even 65°, but the catheter that’s in the pulmonary vein has a high blood flow coming by it, so it has an effect of cooling the tip of the catheter, so even though the catheter temperature that we’re reading at the tip of the catheter is only 46°, the temperature of the tissue deeper is often much higher, so you want to limit the output because you can do damage to the vein and cause what’s called pulmonary vein stenosis, which is something that we want to try and avoid.

So we’ll come off at 60 seconds here. Great. You can see that the signal has now diminished fairly dramatically. Now we’re going to go and look for some more spots within that vein. If you can go to the lateral fluoro view, please. Again, if you look here, we’re in the vein. There’s a signal. Bill, can you pace from the coronary sinus. You can see how that fractionates out and that sharp, spiky potential after that is what’s known as the pulmonary vein potential from the musculature within the pulmonary vein. If you can go to EP review, we can see that. So this is another spot that we’re going to try to ablate. Let’s do this one while we’re pacing. While we’re doing that, if you can go to the ultrasound signal, we can see the fan-shaped artifact of the ablation catheter right up against the ultrasound catheter and right up against the wall of the heart.

So the patient is feeling this a little bit now and that’s not uncommon. There are nerve endings right there. One of the things that’s interesting is that some of the parasympathetic nerve endings that come into the heart around the pulmonary veins may lead to an increased incidence of atrial fibrillation. Some of the success of these procedures, some people are now thinking is due to ablation of some of these parasympathetic nerve endings that cause increased vagal tone on the heart.

Now if we go to EP live screen, you can see those signals that we had seen when we first started ablating. Those very sharp potentials have now kind of been greatly diminished, meaning that we’re doing hopefully a good job of eliminating this. So we’ve
anticoagulated the patient. We like to keep the ECT around 300 so we do not cause a stroke during this procedure.

So now you can see that pulmonary vein potential, at least at this part of the vein, is gone. So what I’m going to do now is move the catheter around to a different part of the vein and see what we can find. So if you go to the lateral view on the fluoro, you can see I’m moving the catheter around a little bit. I’m going up a little higher and spinning it there. So again, you can see the potential to get into this spot. Now if you go to the ultrasound, you can see we’re kind of on the far wall of the vein, so we’d like to come on here with the RF energy. So now what we’re going to do is watch with ultrasound, which is nice because it allows us to directly image what we’re doing. If you’ve noticed, when you’re looking at the fluoro views, it’s pretty hard to tell what’s going on. There’s a lot of shadows there. With the ultrasound, we can directly see where the ablation catheter is within the heart and, more importantly, that we’re staying at the junction of the vein and the atrium to reduce the chance of pulmonary vein stenosis. Again, you can see here that the signal is decreasing, if we go to the live screen, that pulmonary vein potential is dramatically smaller again at this location. So what we’re going to do, essentially, for this vein is go around the os of the vein and find the places where the muscle fibers connect the vein to the atrium and target those so we can electrically isolate the pulmonary vein. We’re off now. So again we’re going to look around. If we go again to the AP screen, you can see the ultrasound and the ablation catheter in the heart. If we go to the lateral view now, again you can see the same thing. I’m going to curve this catheter down a little bit. It has a steering mechanism that allows me to move it. There you can see I curved down just a little bit. Again you can see not a whole lot of presence of signal there, so let’s uncurve it and go up a little bit higher.

One of the things I like to do now is check and see, sometimes it only takes a couple of lesions to isolate the vein, so what I’m going to have Bill do now is pace from the ablation catheter. Remember, when we paced from the ablation catheter before, we were able to capture the atrium. We’ll have to see if that’s the case still now. So we can still get to the atrium, which is okay because we really haven’t done that many lesions yet, so if you come off pacing and pace the CS again, now we just want to find where those connections are. Again you can see there’s some high frequency signal there. Frank, I’m going to have you come on there. If you stay on the live screen, we can see if those diminish.

When this procedure was first being done, people would sit in the lab for hours and hours and wait to see if somebody had an extra beat from somewhere in these pulmonary veins and specifically target that extra beat. What’s happening now is that it’s much more of an empiric approach, where we actually empirically electrically isolate the veins and do a little more ablating within the left atrium to try and eliminate these foci. What happened with the early experience was if you eliminated the foci from one spot, then it would only recur from somewhere else on another day that you hadn’t seen when you were in the lab. The initial experience was that people were coming back for 3 and 4 and 5 procedures and we’re trying to eliminate that.
Again, here you can see the signal on the real time screen has diminished fairly dramatically. We’re achieving temperatures around 42, 43° Celsius with a power of about 50°. We’ll be coming off in a few seconds here. Then we’ll look around this vein again. So if we go to the ultrasound image, again you can see we’re right at the junction between the left superior pulmonary vein and the atrium. We’re going to look around. It’s looking fairly quiet here. There’s a little bit of a potential there, so why don’t we come on right here.

Bill, any more questions from the audience or is everybody just enthralled?

WILLIAM STEVENSON, M.D.

I think I’m sure everybody is enthralled, but people would also like to know whether targeting pulmonary veins like this prevents the triggers from firing or whether it really is doing anything to the substrate for the fibrillation. Of course, the triggers are here, but also there’s increasing recognition that the veins themselves probably participate in perpetuating the re-entry wave front, so it’s likely a combination of the two. Then the third factor may be the interruption of any nerves that may be present in the sympathetic and parasympathetic nervous system that traverse this area, which may also be involved in triggering the fibrillation.

If you switch over to the view screen now, I have up here the images in two windows. The one on the right is the signal that was present before Larry began ablating at this site. You can see there’s a small amplitude potential here. What we have now, after the ablation, is essentially no signal there, so that pulmonary vein potential is gone.

LAURENCE EPSTEIN, M.D.

Bill, what I’d like to do now, again, if we go to the lateral fluoro image, I’ve extended the ablation catheter a little further out into the vein and we’d like to try and pace now, from the ablation catheter, again, to see if we’ve yet isolated this vein. So now you can see that with pacing from within the vein, the atrial signal kind of marches through and is disassociated. That’s very different from what we saw before. If you can point that out, Bill, see how we’re pacing in the electrical signal and they’re just marching through. So that’s a good sign. That makes us think that this vein is actually already isolated and what was that, about 3-4 RF applications to do that? Five. Okay, so that’s not bad.

I think what I’d like to do now is have Dr. Stevenson talk a little bit about the procedure that was done last week on a patient who had persistent atrial fibrillation. That’s a different approach. That’s where you’re more interested in not only eliminating the triggers, but also modifying the substrate. While Bill is telling you about that, I’m going to continue to work here and go to one of the other four veins and try and get that isolated.

WILLIAM STEVENSON, M.D.
What Larry is doing is a segmental pulmonary vein isolation that will remove those triggers and influence the substrate. Now, there are other approaches as well. One is to place circumferential lesions around the pulmonary vein ostia, further removed from the ostia of the vein. That’s an approach pioneered by Carlo Poponi. Another approach focuses on targeting fractionated signals that may help support re-entry. Let’s just talk about these for a moment. If here’s our model of the left atrium with the chaotic multiple re-entry wave fronts, one can envision that if we encircle the veins and create lesions between those encircling lesions and other anatomical structures, such as the mitral annulus, and connecting our circular lesions, we may prevent re-entry wave fronts from perpetuating in those regions, as well as prevent the triggers that initiate the fibrillation.

Now, another interesting observation that relates to what may support fibrillation in the atria are the fact that one often sees fractionated electrograms, as you see in this figure, that may indicate regions of slow conduction that promote re-entry. There are some interesting observations that targeting those areas may also tend to organize the fibrillation into more of a flutter-like rhythm, which can then be ablated.

So about a month ago we did a procedure in a patient who had a little bit more severe atrial disease. This fellow was between the ages of 50 and 60. He didn’t have structural heart disease, but he had a 10-year history of paroxysmal atrial fibrillation that had evolved to become persistent, so that for the past 8 months prior to the procedure, he had been persistently in atrial fibrillation and was very symptomatic and had failed anti-arrhythmic drug therapy with Flecainide, Sotalol, and Amiodarone.

We’ll show you a video now of a little bit different approach to targeting this kind of persistent atrial fibrillation. Here you see tracings that were recorded from within the right atrium, the green tracings, the surface electrocardiogram. The white tracings are from the exploring, roving ablation catheter. We’re already over in the left atrium at this point. You can see that the right atrium has areas that look really quite organized, almost like an atrial flutter, but if you look at other segments of the right atrium, it’s really quite disorganized.

Now, this map was created by acquiring segments point by point. You can see that it’s greatly accelerated, for the sake of time for this presentation. We’re defining the left atrium. Those green tubes represent pulmonary veins and that’s the portion of the vein that does not contain active electrical signal. Now we’re looking from the posterior view and you see on the left hand side of your screen the left superior and inferior veins, and on the right hand side of the screen the right superior vein so far. We noted as we made this map that there are areas of fractionated electrical activity. Those are indicated by those large blue tags that you see toward the inferior portion of the left atrium. Now, we’re going to use those to guide our targeting of the initial ablation lesions in this patient, so we’ve almost got the map defined at this point. You can see there’s still chaotic electrical activity in the atrium. What we’ll do is begin with RF lesions at those fractionated areas adjacent to the right inferior pulmonary vein and for this approach use an encircling anatomic approach, but also include those areas of fractionated electrical activity. So here, rather than just targeting the premature beats, we’re also going to be
targeting more of the substrate that allows perpetuation of the re-entry. You can see that
the red circles on this image are the RF ablation lesions and we’re moving around the
right-sided veins at this point. The right superior and inferior veins are shown as the
purple and red tubes. We’re creating lesions to isolate those veins as well as include the
fractionated areas of the signal. We’ll do the right veins in this case first because we saw
very fractionated atrial electrical activity in that region. Once those are completed, we’ll
move over to the left veins. Again, this image is greatly accelerated in time for the sake
of this video.

If we can stop that video now and go back to the PowerPoint presentation, this is the map
from that patient before we started ablating, with the areas of fractionated electrical
activity indicated by the blue tags here, beneath the right inferior pulmonary vein, and
you see here the very fractionated signals that were present at that site. Then, as we place
RF lesions, what we like to see is that this chaotic atrial electrical activity becomes a bit
more organized, so it goes from this kind of a picture to this kind of a picture, where you
see a lower frequency atrial electrical activity and then ideally termination of the
fibrillation into sinus rhythm. Now, in these chronic atrial fibrillation patients, that
doesn’t always happen. What we often see is some degree of organization and if it
doesn’t terminate, we’ll give Ibutilide to attempt to convert the rhythm.

If we return to the video now, you’ll see the final stages of this procedure. So we
completed our left atrial applications and then we returned to the right atrium and we
identified some areas of fractionated activity in the right atrium that were targeted, then
gave Ibutilide and began giving our flutter line. If you watch the signals at the bottom of
the screen, you see that now the atrial rate is really quite a bit slower and there was
termination of the arrhythmia with restoration of sinus rhythm, some frequent premature
atrial beats, and then persistent sinus rhythm. Now, that was a patient with much more
severe atrial disease and we know that over the next couple of months, as healing occurs,
it wouldn’t be unanticipated that atrial fibrillation would come and go a bit, also as the
Amiodarone washes out. As of the initial four weeks, he has not had any recurrence of
atrial fibrillation to this point, but these are people that clearly have a lower success rate
than the paroxysmal atrial fibrillation patients. So let’s see how Larry is coming back in
the lab.

LAURENCE EPSTEIN, M.D.

Well, we are moving right along. We actually have done ablating in the right inferior
pulmonary vein and have moved up to the right superior vein, so if you go to the AP
fluoro here, you can see that we now have the ultrasound catheter and the ablation
catheter positioned in the right superior pulmonary vein, which is opposed to what you
saw before, which was the left superior pulmonary vein. Now, the superior veins tend to
be more often the place that these foci come from, so it’s important that we abolish them
from the upper veins especially. If we go to the lateral view, you can see what that looks
like as well, the multi-pole catheter in the coronary sinus and the ablation catheter and
ultrasound catheter within the vein. So if you go to the ultrasound image forming now,
again you can see we’re at the os. We can see the vein kind of off to the 3:00 part of your
screen and the rest of the atrium opening up to the 9:00 part of your screen and you can see the fan-shaped artifact that represents the ablation catheter in the middle of the screen, so we’ve done some ablating in this vein, so it might be a good time to check and see if we’ve achieved any degree of electrical isolation. Again, I’ll stick that catheter out the vein again. Bill, if you can pace from the ablation catheter for me, we can show the live image of the signals. Great. You can see here already, with really just doing another 4-5 ablations for this vein, we actually have achieved isolation of the right superior pulmonary vein. If you go to the review screen, you can see the atrial signal kind of marching through while we’re pacing. Bill, if you can show them that with the arrows there, those signals represent the atrial signals marching through while we’re pacing the atrium. If we go back to the real time now, you can see there isn’t a whole lot of signal within that vein. Now, one of the things that we’ve added to this, in addition to isolating the pulmonary vein, some of these patients came back with what are called left atrial flutters. It tends to be a macro re-entrant rhythm that went around the pulmonary veins and is anchored on one side by the left inferior pulmonary vein and then on the other side by the mitral annulus, so what we’ve added is kind of a linear lesion between the mitral annulus and that vein. If we go to the lateral fluoro view here, you can see what we’re going to do to try and make that lesion. I’m going to take the catheter and put it over toward the mitral annulus. I have to come out of the vein to do that, here. If we look at the real time signal now, you can see that there’s both an atrial electrogram on it and a ventricular electrogram. There’s a small atrial signal and there’s a large ventricular signal and that tells us that we’re right on the annulus there, so what we’re going to do is, if we go to the lateral view, start ablating from that spot on the mitral annulus and then work our way back toward the pulmonary vein. Now, because we’re in the body of the left atrium, where you don’t get that significant cooling that you see in the pulmonary veins, we kind of crank up the temperature that we want to achieve to 65° here. So Frank, if you can deliver the radio frequency energy here, we’ll start this ablative lesion.

So like we said, we’ve checked some ACTs. We’re going to check another one. The first one came back at 295 and we gave him some more Heparin, so we’re going to check another one now because we like to see the ACTs somewhere around 300 to prevent any clot forming, either on the catheter or at the site. One of the things that always comes up is anticoagulation in these patients. Because we’ve ablated aggressively within the left atrium, it’s imperative that these patients remain anticoagulated, in our minds, at least three months after the procedure. That’s our practice. Then, depending on the degree of structural heart disease, if they’ve had any recurrence of atrial fibrillation, a decision can be made about stopping the anticoagulation.

Another frequent question that comes up is the use of anti-arrhythmic drugs afterwards. There appears to be a period of time, probably for the first 2-3 months after you do the ablation procedure, that you’ve irritated the atrium itself. So what we like to do is actually continue the anti-arrhythmic that the patient was on. This patient was on Sotalol, so we actually will continue the Sotalol for a few months and then stop it and that often helps the patient get through that period of time when the atrium is irritated.
Now if we go back to the lateral fluoro view, you’re going to see I’m going to withdraw the catheter a little bit. You can see now on the real time image of the electrograms that we’re still near the annulus because we have both an atrial and a ventricular signal. However, you can see the atrial signal is a little bit bigger than the ventricular signal was before and almost a little bit bigger than the ventricular signal, which suggests that we’ve moved a little bit away from the annulus, further away from the ventricle and more into the atrium, so we’re going to go ahead and ablate here as well.

WILLIAM STEVENSON, M.D.

Larry, we have a question from a very informed viewer in Maine that some electrophysiologists advocate giving Heparin before the transseptal is done. How do you feel about that?

LAURENCE EPSTEIN, M.D.

Well, I think that it depends. It’s my feeling that the risk of an embolic event in that short a period of time when you’re doing the transseptal is pretty low, but the risk of the patient being Heparinized if you were to inadvertently puncture the lateral wall of the atrium is significant, so in my mind it’s safer to do the double transseptal, get both catheters over to the left side of the heart, be comfortable that we haven’t perforated the heart and gone outside of the heart, and then go ahead and fully Heparinize the patient. With that approach, and that’s the approach I’ve really used for years, with all my left-sided procedures, things have gone pretty well, so we feel pretty comfortable with that.

WILLIAM STEVENSON, M.D.

A follow-up to that question, what about anti-platelet therapy in your anti-coagulation regimen?

LAURENCE EPSTEIN, M.D.

Well, I think we do put patients on an aspirin as well. I think platelets are important in the embolic events, so I think we routinely do use platelets. While I’m repositioning the catheter here, one of the things we may want to do, as this is an invasive procedure and I think it’s important that people understand there are risks involved in it, maybe you’d like to review for the folks what those are.

WILLIAM STEVENSON, M.D.

If we can go to the PowerPoint slides, I think this will answer several of the questions that we’ve had. The major things that we really take precautions about are thromboembolism, cardiac perforation, and pulmonary vein stenosis, so for thromboembolism, we like to have people anticoagulated prior to the procedure, certainly if they’re having any frequency of atrial fibrillation at all. If there’s concern, and for many of the chronic atrial fibrillation and persistent atrial fibrillation patients, we may do a transesophageal
echo immediately before the procedure to exclude the possibility of a left atrial thrombus and then careful attention to anticoagulation during and immediately following the procedure. We usually transition Lovenox to Coumadin following the procedure, so there’s no window during which the patient is not protected.

For pulmonary vein stenosis, the overall incidence of that has been around 1%, but I really have the impression that it’s falling, with the precautions we now take. Everybody gets an MRI or CT before the procedure to define the pulmonary vein anatomy. As you see here, Larry is carefully imaging with ultrasound. He knows the diameter of the vessels and exactly where the ablation catheter is placed. If we don’t image with ultrasound, then we use the mapping procedure that I showed you in the other video to place the RF lesions some distance from the ostia. Now, that winds up requiring more RF applications and a bit more power. We use typically an 8 mm electrode and up to 70 watts of power for that purpose because the atria are likely to be thicker in those regions, but then you’re out a way from the pulmonary vein. Of course, regarding perforation, that’s care with the transseptal careful energy titration, avoiding any pops from the RF, which is really quite uncommon with careful temperature monitoring.

Larry, how are things looking?

LAURENCE EPSTEIN, M.D.

We’re moving along with this line that we’re making from the annulus. If we go to the lateral fluoro screen, you can see that the catheter is now a little higher up. The coronary sinus catheter, the one with multiple electrodes on it, is actually right within the AV groove on the left side, so that’s where the mitral annulus runs and we’ve kind of pulled back away from that and we’re continuing to make our ablative line there and things are going fairly smoothly with that. I’m going to pull back a little bit more right now and head toward the inferior pulmonary vein.

So again, if you look at the real time signal, you can see there’s a much smaller ventricular signal, which is the second component, and a much larger atrial signal, suggesting we’re further away from the annulus and on the wall of the atrium. If we go to the ultrasound image, I think you can make out there’s a little bit of an artifact almost at noon within the chamber of the heart, which shows the ablation catheter on the wall within the body of the left atrium.

WILLIAM STEVENSON, M.D.

Larry, we also have a question regarding the sedation required during the procedure. I know some laboratories do these sorts of procedures with general anesthesia. Clearly that’s not what’s going on here.

LAURENCE EPSTEIN, M.D.
That’s correct. We’re fairly comfortable in that we have very experienced nursing staff, well trained in the use of conscious sedation. We use mostly a combination of Versed and Fentanyl to keep patients comfortable during the procedure. The patient right now, you probably can’t hear, but there’s a little bit of snoring going on. He’s quite comfortable and is essentially sleeping throughout the procedure. You don’t have the same risks of general anesthesia, but the patients are comfortable and most of them clearly wake up and say this wasn’t as bad as they thought it was going to be.

WILLIAM STEVENSON, M.D.

We’ve also had several questions about the overall success rate. If we go back to the PowerPoint presentation, in general, for paroxysmal atrial fibrillation of this type, efficacy is in the range of 60-80%. In some patients, it may take a second touch-up procedure after things have healed, but with carefully selected patients, we’ve really been quite pleased. With persistent and permanent atrial fibrillation, the success rate definitely falls and more procedures may be required, but for some patients, who are very symptomatic and have failed anti-arrhythmic drug therapy, it’s quite a good option. One needs to always balance the risks of the procedure, as we have discussed, with the potential benefits, keeping in mind that atrial fibrillation is not a fatal arrhythmia. We’re really doing this more from a standpoint of improving quality of life. Larry?

LAURENCE EPSTEIN, M.D.

Great. So we’re continuing on. If we go to the lateral fluoro screen now, you can see that we are in the body of the left atrium, a little bit further away from the annulus. If we go to the intracardiac ultrasound screen, you can see that artifact floating around within the heart, which is the ablation catheter up against the atrial wall. You just saw a change in the ultrasound image and what that represented was the radio frequency energy coming off. When you turn the radio frequency energy on, you do get this kind of noisy artifact on the ultrasound, but you can still see. Then, when it comes off, you can see pretty well.

So I think what we want to do now is kind of get this catheter over toward the inferior pulmonary vein again, so if we image with the ultrasound catheter, I’m going to manipulate this around a little bit. Great. You can see here, we’re coming up the superior veins and then I’ll put the sheath in a little bit further to try and get myself down into one of the inferior veins here. I’m going to enter right into it there. I’m then going to go ahead and take the ablation catheter and see if I can put it in as well. Hopefully we’ll be able to see the ablation catheter in view right there shortly. I have the two catheters in there. Again, you can see there’s a signal, a small signal, right there on the ablation catheter. That’s kind of coming and going on the live image of the electrograms. So we’re going to turn the energy back to 50° and 50 watts because we’re in the vein and we’re going to come on here.

WILLIAM STEVENSON, M.D.
We’ve also had several questions regarding how long ablation has commonly been used for atrial fibrillation as well as other arrhythmias. We’ve been doing it here for about 5 years, starting with very selected patients who had clearly pulmonary vein triggers and expanding it. I think this has been a practice at many large tertiary centers that do these types of ablation procedures. Radio frequency ablation for other types of arrhythmias has been going on for well over a decade and it’s really become a first line therapy for many types of paroxysmal supraventricular tachycardias. It’s also quite a good option for patients with ventricular tachycardias that have recurrent shocks from implanted defibrillators.

LAURENCE EPSTEIN, M.D.

If we can show the ultrasound image here, again we’re right at that junction of the vein and the atrium. You can see the ultrasound catheter is positioned in the middle and it’s over, off to the side of the vein. If you look to the 9:00 part of that screen, you can see that it opens up into the body of the atrium and we have that fan-shaped artifact of the ablation catheter situated right at that junction. You can see there’s a little bit of a signal there still.

I think catheter ablation has really been a remarkable tool. For years, as Bill just mentioned, we’ve been using it to treat a wide variety of arrhythmias. Now, WPW syndrome or ventricular pre-excitation or supraventricular tachycardias, which often were very troubling for patients and very difficult to treat, probably are cured well over 95% of the time. I think we did close to 400 ablations last year and probably will go significantly over that, and it’s ablations for all types of arrhythmias, not just for atrial fibrillation, but for some of these other non-life threatening arrhythmias in the upper chambers of the heart and then also some of the arrhythmias in the lower chambers of the heart, which can be life-threatening, called ventricular tachycardia as well.

So we’re ablating away here and hopefully getting close to finishing up. You can see we’re in the vein there and we’re going to come off in a couple of seconds. I’m going to pull the ultrasound back into the body of the atrium and look around a little bit.

WILLIAM STEVENSON, M.D.

What’s your endpoint for the procedure, Larry?

LAURENCE EPSTEIN, M.D.

My endpoint is to demonstrate that we’ve actively isolated all of the veins, so what I’d like to do is make sure that we get into each of the veins, and that’s where the pre-procedure image really helps in that we know exactly how many veins the person has and what’s going on and then we enter each vein, pace from inside the vein, do the ablation, and then assure ourselves after pacing.
If you look at the real time ultrasound image now, we have a nice view. I’ve pulled the catheter back to the body of the left atrium. What you can see on the left side is the pulmonic valve opening and closing there. On the bottom of the screen, you can almost see the start of two legs coming out. That’s actually where the pulmonary veins are coming out. Let’s just go through the image again. At the top of the image, the valve opening up is actually the mitral valve down into the ventricle. Over at about 9:00 is the aortic valve in the outflow tract of the left ventricle. So what I’d like to do now is see where we are. I’ve gotten into all of the veins and done some ablating, so I want to see if we have isolation. We’re going to start up top here. If we go to the fluoro image on the lateral, you can see that we’ve got the ablation catheter sticking straight up out of the vein and we’re twisting the ultrasound catheter around to get there as well. Now we’re there. Then, if we pull this back toward the body of the atrium, again, where that junction is, we’re right there. Bill, if you can pace from the coronary sinus again, we’re right at that junction there. Looks like we have a little more touching up that we need to do. You can see there that there’s a signal, if you go to the real time EP screen for me, that we’re actually pacing. You can see there are some pulmonary vein potentials there, so if we can come on here, Frank, with the ablation and go to the ultrasound screen, again you can see we’re right at the junction between the os of the vein and the atrium. On the left side of the image, over toward 9:00 or 10:00, you can see the mitral valve opening and closing right where the vein kind of meets up with the left atrium. That assures us that we are right at the junction and reducing the chance of pulmonary vein stenosis. In addition, if you look on the screen, you can see those kind of tick marks. Each one of those represents 16 mm, so you can see from top to bottom, this vein is somewhere in the range of 2.5 cm side at its junction with the atrium, so that’s fairly big and we feel fairly comfortable ablating at that spot to try to eliminate these connections because the chance of stenosis in a vein that large is going to be incredibly small.

Now we’re continuing to ablate. If you look at the real time screen during ablation, you can see that the signal that had been on the electrical recording is pretty much gone while we’re ablating at that spot, so I’m just going to look around there a little bit more.

WILLIAM STEVENSON, M.D.

If we go to the review screen, you can see that here on your left is the pre-ablation signal, which was pretty small to start with, after the prior ablation, but after ablation there’s really very little signal there.

LAURENCE EPSTEIN, M.D.

Frank, do you want to come on here as well? Again, we’re in the vein. We’re going to try another attempt at ablation. Again, we’re ablating away here. So things are moving along pretty smoothly. The other thing that we do in this procedure is, after we leave the left atrium and come back to the right side of the heart, we do what’s called a typical flutter isthmus, so that’s an ablative line between the tricuspid annulus and the inferior vena cava. That’s because we know that people with atrial fibrillation often has a cousin arrhythmia called atrial flutter. It’s a much more organized atrial arrhythmia, where the
electrical signal can go around and around in the right atrium and it gets funneled between the opening of the tricuspid annulus and the opening of the inferior vena cava, so if you make that area electrically unexcitable, you can actually eliminate atrial flutter. Now, some people do atrial ablations as part of their atrial fibrillations. Other people don’t. I think that we’re in here already. The additional time and risk of that is exceedingly small and it’s worth having the patient, having gone through this, not have to come back if they have atrial flutter.

So why don’t we see if we can pace from this vein, so I’ve got the catheter now out the pulmonary vein here and if we look now, with the catheter out of that vein, it looks like we have no more conduction. Then I’m going to flip it around, if you show the fluoro image now of the lateral camera.

WILLIAM STEVENSON, M.D.

Larry, a question from the Netherlands: How long does it take in our practice for the possible recurrent arrhythmias to fade away before you can really declare that the patient has had an effective procedure and is cured of their atrial fibrillation?

LAURENCE EPSTEIN, M.D.

That’s a good question. I think in our experience and other people’s experience, there’s kind of what we call a blanking period almost, where we decide that in the first 2-3 months, patients can have recurrent arrhythmias, often due to the irritation, probably not all that dissimilar from the arrhythmias that I’ve seen after cardiac surgery and the irritation of the atrium, so if somebody has an early recurrence, let’s say within a month or two, we usually don’t worry about that. We just kind of ride people out psychologically as well because they’ve undergone a procedure and would like not to have it anymore, but if you prepare them ahead of time that it may occur, we then see it tends to die off over time and after 2-3 months, may even go away altogether. I think that’s the reason for continuing anti-arrhythmic drugs during that period of time, to decrease those episodes. Early recurrence within the first month or two has clearly been not associated with long-term success or failure.

So now I’m going to stop pacing for a second and I’m going to flip over to the other superior vein, so if we go to the AP fluoro image, you can see I’m out the right superior pulmonary vein. Bill, if you can pace here, we can clearly see that again we’ve isolated this vein now. If you come off pacing, I’m just going to slide the catheter down a little bit to the right inferior pulmonary vein, which is right down here. It looks like we may have a little bit more work to do right there. Let’s see if we can get right on the edge of that and flip the ultrasound there as well.

WILLIAM STEVENSON, M.D.

That signal has a little bit of a fractionated appearance.
LAURENCE EPSTEIN, M.D.

Sure, if does. If we go to the real time screen, we might be able to see that. Again, if we go to the ultrasound image now, you can see again the ultrasound is in the body of the atrium, just to the left of the ultrasound catheter. At 9:00 is the aortic valve and then at the top of the screen you can see the pulmonary veins kind of opening up. I’m going to manipulate that around a little bit and actually get out one of the pulmonary veins there. Right there, you can see I go right into the pulmonary vein and then come back toward the os. You can see the junction of that vein and then the inferior vein right near that. If I pull back a little bit, I’m going to see the ablation catheter right at the os of that inferior vein here. You can see that right there. So if we come on here with ablation, great, so we’re moving along here. If you go to the real time image, you can see what’s happening to the signal. It’s getting even a little more fractionated as we’re ablating.

WILLIAM STEVENSON, M.D.

It’s really spreading out, isn’t it?

LAURENCE EPSTEIN, M.D.

Yes, so that’s suggesting there’s some block coming with the ablation into the vein.

WILLIAM STEVENSON, M.D.

We used to see this a lot more when we were using lasso catheters to guide pulmonary vein ablation.

LAURENCE EPSTEIN, M.D.

Yes, Bill, why don’t you mention your experience? One of the ways that this procedure had been done in its early evolution was to put a lasso catheter into the vein. I don’t know if you want to tell people what that is.

WILLIAM STEVENSON, M.D.

Yes. A lasso catheter is a circular catheter that has 10-20 electrodes. It essentially encircles the vein. It was developed by Michel Haissaguerre and his group in Bordeaux and it was really fundamental to teaching us how to do pulmonary vein isolation. He taught us that there were these sleeves of musculature and then we had to go back to the anatomy and pathology literature and see that, yes, these had been previously described. It taught us that you didn’t have to completely encircle the vein to get rid of the potentials that were in the vein beyond the os of the vein. However, it became clear, as you had mentioned earlier, that if somebody has 1-2 of those foci, they’ve got a bunch of them and by moving the ablations more to an ostial approach or even a little bit outside the ostia, the efficacy seemed to be greater and the risk of pulmonary vein stenosis less, so we’ve moved a bit away from using lasso catheters here the past couple of years, but they
were of great value in teaching us a lot about pulmonary vein anatomy and interpretation of those electrograms.

LAURENCE EPSTEIN, M.D.

Okay, if we go to the ultrasound image here, you can see we’re in the body of the atrium with the ultrasound catheter. If you look almost straight down at 6:00 or maybe 6:30, you can see where the inferior pulmonary vein is coming up into the body of the atrium. Coming in and out of view is that fan-shaped artifact, pointing straight down toward 6:00. That’s the ablation catheter, so we’re ablating right at the mouth of that inferior pulmonary vein. When we started this ablation, we had a pretty large fractionated signal there. If you go to the real-time screen, you can see there’s almost nothing now at that site, as we’re continuing our ablation. So now, again, I’m going to go up into the vein. If you would try and pace here again, Bill, for me from the ablation catheter, we still have a little more work to do. We’re capturing it right there and there we lose it, so why don’t we come off pacing and see what that looks like. Again, we don’t see much of a signal there, but we are capturing the heart. We’re going to let the signal recover for a second.

WILLIAM STEVENSON, M.D.

When pacing, of course, you saturate the recording amplifiers. If you don’t wait a little bit of time to let them recover, you may not see a low amplitude potential.

We had another question from an informed viewer who’s doing pulmonary vein isolations and who finds that the right inferior pulmonary vein is often somewhat difficult to adequately explore and cannulate. They wanted to know if you had any special tricks to that or if you had ever tried using different types of sheaths.

LAURENCE EPSTEIN, M.D.

I agree. Sometimes I have found that the sheath itself can be more of a hindrance. What he’s talking about is the fact that you’re coming across the septum in this direction and then actually having to make an acute turn back in the other direction. Sometimes the sheath itself can be a hindrance. One of the biggest things sometimes that’s helpful, we tend to use one of these EPT bidirectional, steerable catheters for this that allows you to manipulate in both directions. Sometimes actually pulling the sheath back and allowing the catheter to have more freedom is helpful in doing the ablation, so I’ve found that to be a helpful way for doing it.

What I’m going to do now again is to pace from within the vein here and see where we are. Again here I think we can see that now this vein is isolated, so we’re back up in the superior. I’ve demonstrated before that we had isolated the left superior vein. That was the first vein that we did. While Bill was discussing the persistent case, we went ahead and isolated the right superior and right inferior. When we did the mitral isthmus line, we went ahead and did the left inferior as well.
We’re pretty much done with the procedure on the left side of the heart and I think that’s what’s of interest to the viewer here. What I would like to do is thank everybody for coming. I think all that’s left to do now is I’m going to withdraw these sheaths back to the right side of the heart and do a typical right atrial flutter isthmus and then we’ll be done. That usually takes about 10 minutes. So you can see that the ablative part of the procedure itself took about an hour and 15 minutes or so for this. There was the time in getting the catheters into place, but routinely for this type of segmental ablation, we can pretty much do the whole procedure in under 2 hours, which makes it less of an ideal for the patient and certainly less of an ordeal for us and our staff, so I’d like to thank everybody for joining us today. I think this website is going to be up and available for some time. Bill, I think you may have some parting comments. Again, thank you for coming.

WILLIAM STEVENSON, M.D.

Thank you very much, Larry. I’m sorry that we haven’t been able to get to all of the email questions that have come in. We’ve really had quite a large number and we will over the next few days try to answer you by email. A couple of things that did come up, there were questions regarding whether the presence of a pacemaker or an implanted defibrillator influenced our ability to do this procedure. In fact, those are not at all contraindications. We do RF ablation procedures in patients with implantable devices. There were questions regarding who might be considered for first line therapy catheter ablation for atrial fibrillation. In our view, you can see that this is technically still not a trivial procedure and that there are risks. It’s important to balance the risks with the potential benefits. So the patient who has no structural heart disease, paroxysmal atrial fibrillation, who has failed anti-arrhythmic drug therapy and is still very symptomatic is the ideal candidate, but there are many other people who would also stand to benefit from the procedure.

I’d like to thank you all for watching and remind you that this webcast will be available for the next 24 hours with CME credits as well by logging onto this website. Thank you very much and good night.

NARRATOR

This has been a catheter ablation for atrial fibrillation from Brigham and Women’s Hospital in Boston, MA. For more information, to make an appointment, or make a referral, please click the buttons on the player window or the web page.