NONSURGICAL INTRAVENOUS CATHETER

TREATMENT FOR ATRIAL FIBRILLATION SUFFERERS

ST. LUKE'S-ROOSEVELT HOSPITAL, NEW YORK, NY

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NARRATOR

The American Heart Association estimates that about 2 million Americans suffer from the most common form of arrhythmia, atrial fibrillation, also known as AFib. AFib is responsible for an estimated 70,000 strokes in the United States each year. Those treated with surgery face the typical risks of complications. Today, however, there are new treatments for AFib sufferers. At St. Luke's-Roosevelt Hospital in New York City, surgeons are performing a revolutionary nonsurgical intravenous catheter technique which reduces the risks associated with surgery and chronic medical therapy. This new procedure is known as radio frequency ablation therapy.

JONATHAN S. STEINBERG, M.D.

The ablation therapy is designed to eliminate the trigger sites of atrial fibrillation. Most of the triggering sites are located within the pulmonary veins, which are attached to the posterior portion of the left atrium and we ablate at the pulmonary vein opening at the left atrial junction and eliminate all the muscular connections of the pulmonary veins to the left atrium, thus blocking all the potential trigger sites.

NARRATOR

Catheter ablation techniques have been designed and successfully applied to a variety of patients with AFib. Two catheters are used, a mapping catheter and an ablation catheter which delivers the radio frequency energy. Chronic medical therapy has been the mainstay of AFib treatment, but today, sufferers who are wary of medications or surgery can choose nonsurgical arrhythmia treatment.

JONATHAN S. STEINBERG, M.D.

The most profound benefit, the most satisfying for both the patient and the physician, is ultimately the great proportion of these patients, around 80% of them, will become completely

free of atrial fibrillation and its symptomatology, so that will be a tremendous change in quality of life for the patient.

NARRATOR

You are about to see a nonsurgical arrhythmia treatment known as radio frequency ablation therapy, using the radio frequency energy at St. Luke's-Roosevelt Hospital in New York City. During today's presentation, you may send questions to the faculty at any time by clicking the email button below.

AVI FISCHER, M.D.

Good afternoon and welcome to St. Luke's-Roosevelt Hospital Center in New York City, where today we are going to performing live a nonsurgical intravenous catheter treatment, known a radio frequency ablation, for the treatment of atrial fibrillation. I'd like to introduce to you Dr. Jonathan Steinberg, the Chief of Cardiology and Director of Arrhythmia Service here at St. Luke's-Roosevelt Hospital Center, who will be performing the procedure today.

JONATHAN S. STEINBERG, M.D.

Good afternoon. We're in the electrophysiology laboratory at St. Luke's Hospital. The patient on the table is undergoing a procedure for treatment of atrial fibrillation. The target of the procedure is the pulmonary vein and left atrial junction. Strategically, what we're trying to do is eliminate the muscular connections between the pulmonary vein and the left atrium. We will target each one of the pulmonary veins. We are in the middle of the procedure now and I'll introduce you to my colleague now, Dr. Isha Arshad*, who is at the bedside and Dr. Margot Vloka will be joining us shortly, and we have a team of nurses here, Sue and Cheryl and Tess, and we're going to proceed on with the procedure. We're in the midst of ablating the first targeted pulmonary vein. Before we show you portions of our ablation procedure, we will go a pre-recorded segment that takes you through the process of the transseptal puncture, which is the initial portion of the ablation procedure. We'll go to that now.

GRAPHIC

Atrial fibrillation. Curative catheter therapy.

JONATHAN S. STEINBERG, M.D.

We're placing a Brockenbrough needle in a long sheath. The long sheath has already been passed up from the femoral vein, through the IVC and right atrium, up into the superior vena cava, the sheath and the dilator, and that will be the route by which we can introduce catheters into the left atrium for mapping an ablation. On the fluoro image now, that's the long sheath up in the superior vena cavum and the Brockenbrough needle is passing up through it. As it reaches the distal tip, you'll see the stylette of the Brockenbrough needle extend just a little bit out, as it just did now, and we can take the stylette out and we'll hook the Brockenbrough needle up to a pressure transducer. We'll use several techniques to determine when we've successfully crossed the fossa from the right atrium into the left atrium, including pressure recordings, fluoroscopic images and, very importantly, an ultrasound image. The ultrasound image will first show us tenting of the fossa, then relief of tenting as the needle passes into the left atrium, and then we'll confirm successful passage into the left atrium as we see echodense bubbles when we flush the lines.

On our monitor, we have a right atrial pressure visible now. We're going to withdraw the sheath from the SVC into the right atrium. The sheath will be oriented posteriorly and on the fluoro image, as the sheath in the upper portion of the image is being withdrawn, as it comes across the fossa, it will fall into it and you will see a characteristic jump of the sheath into the fossa. That's the biplane image. We'll check both planes. Although that wasn't the big jump, it looks like it has oriented itself posteriorly, probably over the fossa, which we can now verify with an ultrasound image. If the fossa is not tented, then we haven't gotten onto it yet. That's a nice

image showing the fossa's very much tented. This happens to be a very patulous fossa. That sometimes can make it a little more difficult to cross into the left atrium. The needle was advanced into the left atrium and we see a left atrial pressure tracing now present and we should see relief of the tenting on the ultrasound, if we look again at the fossa, and that's slightly tented, probably because the sheath, rather than the dilator, is up against it. That'll be gone once we adjust the sheath itself, but first we're going to withdraw through the needle and we see pink, oxygenated blood come back, perfect confirmation that we're in the left side of the circulation. Then we will flush the line and we'll be able to see the burst of bubbles right there on the ultrasound image. Clearly we're in the left atrium. We're going to pull the dilator back and pass the sheath in, which we've just done. Both sheaths are now in the upper portion of the screen, sitting in the left atrium, and we'll check the ultrasound and probably find that…we'll get the fossa up on the ultrasound and probably see that it's now back to its previous flattened position. There's the fossa and it's much flatter. Now we'll leave the sheath behind in the left atrium and we'll be able to place our ablation and mapping catheters through it.

Now that you've seen the transseptal portion of the procedure, we proceed to the ablation segment. That involves mapping the ostium of the pulmonary vein to locate where the pulmonary vein potentials are. Pulmonary vein potentials indicate the physical or anatomic location of the muscle strands that are the target of our ablation procedure. In front of me are several different monitors. The two large monitors are for recording within the pulmonary vein and on the ablation catheter. On top, we have some fluoroscopic images and a live, real time echo image. If we take a look at one of the fluoroscopic images, you can see the technique that we'll be employing to ablate the pulmonary vein. There is a circular catheter, or mapping catheter, that allows us to record from multiple sites around the circumference of the pulmonary vein.

GRAPHIC

Atrial fibrillation: Scope of the problem

1. More than 2 million patients in the US.
2. Very common in the elderly.
3. Significant economic impact.
4. Substantial morbidity due to symptoms.
5. Associated with stroke, heart failure, and death.
6. Most common arrhythmia prompting hospitalization.

JONATHAN S. STEINBERG, M.D.

Based on the mapping data from that lasso catheter, we're able to target the ablation catheter to a specific point and deliver radio frequency energy and hopefully cauterize or ablate the segment of muscle that connects to the left atrium from the pulmonary vein. The strategy is to ablate each one of those muscle strands until no longer are any muscle strands connected to the left atrium and that pulmonary vein is then effectively isolated from the left atrium and any triggering

activity that may occur within the pulmonary vein cannot reach the left atrium. We're now targeting a left-sided pulmonary vein. That left-sided pulmonary vein in this particular patient is a common pulmonary vein, which usually takes more extensive ablation efforts. We're at the very end of this ablation, we believe. We ablated originally while the patient was in atrial fibrillation and eliminated the vast majority of muscular connections, and right now we're at the very edge of the pulmonary vein before it enters the left atrium and we're dealing with the few muscle fibers that are located at this section. As we continue to finish off this pulmonary vein, we'll move over to Dr. Fischer, who will give you a little bit of background about atrial fibrillation and how atrial fibrillation ablation is performed.

AVI FISCHER, M.D.

More than two million patients in the United States are affected with atrial fibrillation. In fact, atrial fibrillation is the most common heart rhythm problem that we see in practice. It's very common in the elderly and as people get older, atrial fibrillation becomes more common. Because of the numbers of people affected with atrial fibrillation, atrial fibrillation has a significant impact on health care expenditures and on the economy, in general. There is substantial morbidity from atrial fibrillation due to the symptoms associated with atrial fibrillation. Additionally, atrial fibrillation is associated with a risk of stroke, is associated with congestive heart failure, and on occasion either with death. Atrial fibrillation is the most common arrhythmia prompting hospitalization.

GRAPHIC

Some sobering facts about the prevalence and cost of AF:

1. Costs are driven by hospitalization and by stroke due to AF.

2. As many as half of patients eligible to receive warfarin do not.

AVI FISCHER, M.D.

About 1% of the general population now has atrial fibrillation and in patients over 60 years of age, those account for about 5%. The prevalence of atrial fibrillation is expected to increase by about 2½-fold by the year 2050. At this time, about 1% of total health care expenditures are for atrial fibrillation-related expenses and these costs have doubled over the past 5 years. Costs related to atrial fibrillation are driven by hospitalizations due to atrial fibrillation and by the association of stroke with atrial fibrillation. In general, use of anticoagulants, such as Coumadin, reduces the risk of stroke in patients with atrial fibrillation. However, as many as half of patients who are eligible to receive anticoagulants, such as Warfarin or Coumadin, do not receive those anticoagulants.

GRAPHIC

AF management: Array of options

- Cardioversion

- Drugs

- Holter
- Anticoagulation
- Ablation
- Surgery
- Device
- See a different MD
- Change drugs

AVI FISCHER, M.D.

The treatment options for atrial fibrillation are multiple and include use of medications for controlling the ventricular rate during atrial fibrillation, as well as attempting to suppress atrial fibrillation. In addition to pharmacologic therapy, we use anticoagulants to reduce the risk of stroke in patients with atrial fibrillation. Patients often require cardioversion to attempt to restore sinus rhythm. Often medications are changed and patients not infrequently require attempts at several medications in order to treat atrial fibrillation effectively. In addition to medications and cardioversions and anticoagulation, there are procedures such as the one being performed today, radio frequency ablation procedures, which are aimed at curing atrial fibrillation or preventing recurrences of atrial fibrillation. Additionally, there are surgical procedures that can be performed to prevent atrial fibrillation, as well as device implants which can be occasionally used for the treatment of atrial fibrillation.

At this time, I would like to go back to Dr. Steinberg, who's going to give us an update on where we are holding with the ablation.

JONATHAN S. STEINBERG, M.D.

We're completing our ablation of the left-sided pulmonary vein and I just want to give you a little more information about the equipment we use during the procedure. On my right is a very sophisticated electroanatomic mapping system and we've outlined the pulmonary vein here. It really extends a little bit further. These are the sites at the pulmonary vein ostium that we've ablated. You can see the dots. We've drawn a circle at the dots to indicate that this is the approximate size and shape of the pulmonary vein ostium. You can see that we delivered about eight lesions around the ostium and ultimately the percent of the circumference that we've actually ablated is probably no more than about 50-60% and that's somewhere in the average range that is typically accomplished with these ablation procedures. We'll track the locations of our ablation using this sophisticated system and we'll make sure the catheter is stable. You can see the catheter pointing downward here. It's out of the pulmonary vein now. When it's in the pulmonary vein, it will be located right at one of those dots where we're doing the ablation. This left-sided pulmonary vein now looks like it's been completely isolated. You may appreciate that the recording that we've made within the pulmonary vein is now showing only very, very low amplitude recordings. These are artifacts, but the pulmonary vein itself is not recording any electrograms.

I can show you something that occurred earlier during our procedure. These are the recordings made during the procedure and I'll give you an example of the effect of the ablation on the local recording site. This is the patient here, who is now in atrial fibrillation, and these are multiple recording sites within the pulmonary vein. These very large electrical recordings are the pulmonary vein recording sites that we're targeting within the vein. You can see very discrete electrograms. As the ablation proceeds, you can see the electrograms disappear and at this point in time, this vein is no longer connected to the left atrium.

We are now going to proceed with completion of the left pulmonary vein ablation. If we focus on the fluoroscopic image, we're going to be pulling back on our mapping lasso catheter and allow it to fall back into the left atrium. While that's occurring, I'll be concentrating on the recording to make sure that there are no residual pulmonary vein recording sites present, so Margot, let's pull back on the lasso.

MARGOT VLOKA, M.D.

I advanced it distally and now I'm going to pull back. Getting close…and out.

JONATHAN S. STEINBERG, M.D.

Okay. And there were no pulmonary vein potentials whatsoever. Clean. So we're going to move over to the right upper pulmonary vein now, now that we've taken care of all the left-sided pulmonary veins.

AVI FISCHER, M.D.

While we're waiting, before moving over to the right side, there was an email question that I'll read here. The question is, "How effective is the treatment for patients with paroxysmal atrial fibrillation?" The questioner says that they have been told that this type of treatment is ineffective for paroxysmal atrial fibrillation, since it's kind of like a "shot in the dark."

This procedure can be performed both in patients in sinus rhythm, patients who have paroxysmal atrial fibrillation, as well as during episodes of atrial fibrillation. Because we're targeting potentials from muscular sleeves that occur and exist at the connections between the pulmonary vein and the left atrium, these potentials exist during atrial fibrillation as well as during sinus rhythm, so this procedure is quite effective for patients who have paroxysmal atrial fibrillation and, in fact, very often that is the patient population that we perform this procedure in, patients who are very symptomatic during their episodes of paroxysmal atrial fibrillation. I think we can see if we can go back to Dr. Steinberg at this time.

GRAPHIC

Mechanisms of atrial fibrillation:

1. Focal atrial tachycardia.

2. Multiple wavelets.

JONATHAN S. STEINBERG, M.D.

If we look at the fluoroscopic image, you can see a catheter that extends to the upper left portion of the screen. That's our ablation catheter. You can see it's extending in an upward direction outside the cardiac silhouette. That catheter has entered the right upper pulmonary vein. Over that catheter, a sheath is being advanced, and now we're pulling back on the catheter, into the sheath. We're going to use that sheath that's now located within the proximal segment of the pulmonary vein to perform an angiogram, which will define the anatomic features of the proximal portion of that vein and help guide our catheter position. This is an anatomic-based procedure, much more than many of the other ablation procedures we perform. It's not necessary for the patient to go into atrial fibrillation during the procedure. We have made the assumption, based on lots of previous data, that the pulmonary vein is the likely trigger site of atrial fibrillation. Therefore, it's our plan to completely isolate each one of the pulmonary veins. We've done an angiogram which has outlined the pulmonary vein anatomy. We can see that the lasso catheter is, in fact, sitting at the proximal segment of the pulmonary vein. That lasso catheter is probably a little too big and we're going to downsize to a smaller lasso catheter.

AVI FISCHER, M.D.

At this point, what I'll do is just go through the two main approaches to the ablation procedure for atrial fibrillation and we'll go back to the live images. The two main approaches that have been used are circumferential lesions encircling the pulmonary veins, with less emphasis on the actual focal triggers. What we're doing today is the second approach, which is ablation of the focal triggers that are identified with the lasso catheter at sites of pulmonary vein potentials. I think now we can go and take a look at that pulmonary venogram.

GRAPHIC

Ablation procedure for AF, 2 main approaches:

1. Circumferential lesions encircling the pulmonary veins.

2. Focal ablation at sites of pulmonary vein potentials.

JONATHAN S. STEINBERG, M.D.

We now have an angiographic image of the pulmonary vein up on our screen. You can see the pulmonary vein entering, the right upper pulmonary vein. The sheath is positioned a little more distally. The lasso mapping catheter, you can see, is positioned right at the opening of the vein and is moving fluoroscopically with the vein itself. On the mapping catheter, we have a very nice demonstration of pulmonary vein potentials that are what we use to guide where we're going to ablate. This is the actual recording from the pulmonary vein. You can see on a portion of it, there are actually two discrete signals. One of them, the first one, is the atrial signal, from neighboring right and left atrium. The second, much larger, sharper signal, is the pulmonary vein potential. You can see it recorded from around the entire circumference. We're going to pick a target site, based on the earliest bipolar electrogram recording.

GRAPHIC

1. Pre-procedure CT scan to evaluate PF anatomy.

2. Double transseptal puncture using intracardiac echo guidance.

3. Anticoagulation of patient after transseptal puncture to prevent thrombus formation on catheters.

AVI FISCHER, M.D.

Just to explain to the viewers a little bit about what PV 3 and 4 means, the lasso catheter is a catheter that has electrodes all around, like the face of a clock, and we use certain electrode pairs to number and anatomically locate where we think the earliest potentials are coming from, so PV 3 and 4 just means electrodes 3 and 4 on that catheter.

JONATHAN S. STEINBERG, M.D.

We're now doing some labeling on our cardo system. The tip of the ablation catheter will be advanced out a bit more distally and then we will do a pull-back and the system is able to then give us an image of where, approximately, the pulmonary vein is located, and that will be a permanently stored image for us to refer to in the future on this patient.

So we'll target PV 3 and 4, and I'm going to adjust my power settings on the radio frequency generator.

GRAPHIC

Complications of pulmonary vein isolation procedures:

1. Related to venous access.

2. Cardiac perforation and tamponade.

3. Thrombolic (e.g., CVA, MI).

4. Pulmonary vein stenosis.

Total complication rate ~2%

JONATHAN S. STEINBERG, M.D.

We're going to move that ablation catheter. When you look up at the LAO image, you can see the mapping catheter is like the face of a clock and we're going to be targeting at approximately 6:00. We're getting very close to that now. We'll put that ablation catheter right at our target sites and then we'll move the ablation catheter a little proximal to the mapping catheter and we'll deliver our RF energy. We're picking up some artifact here, which means we are now touching the mapping catheter with the ablation catheter, which means we're probably in range. Let me take a recording and I'm going to compare the ablation site with our mapping site and it is indeed earliest, so we're going to mark the lesion here and we're going to ablate right at this site.

Now we're delivering radio frequency energy and you can see artifact on our recording, indicating the delivery of RF energy. It's a little easier to see. What we're looking to do is change the sequence of activation and also change the amplitude of the local recording. We're starting to get a little bit of fractionation at the recording site, which indicates that that site is indeed being ablated. We've reached an adequate temperature. The local site is also becoming much smaller in amplitude and is also gone. I think it becomes apparent, if you compare what it looked like at the beginning, here, and what it's starting to change to over here. If we're a little off in our contact or a little off in our location, we may see only minor changes and sometimes it does take a number of lesions to completely eliminate the connection at that particular site.

AVI FISCHER, M.D.

The question is, "What effect does the ablation have on the functioning of the left pulmonary vein and are there any deficits which are associated with the procedure?"

A good question. So, there are complications associated with this procedure. Those complications are related to the venous access that we make in the groin. Additionally, from the needles, when we do transseptal puncture, there are risks of cardiac perforation and accumulation of fluid outside the heart, causing what is referred to as cardiac tamponade. There are risks associated with catheters being placed in the left atrium, risks of clots forming on the catheters and embolization. This we reduce by giving the patient blood thinners once we cross over to the left side of the heart. Lastly, there is the risk of pulmonary vein stenosis or narrowing of the pulmonary vein as a result of the radio frequency ablation procedure. This we minimize, and we have learned over time how to minimize this by performing the ablation outside of the vein, actually at the junction of the left atrium and the pulmonary vein, to minimize that risk. The total complication rate of this procedure is about 2%.

JONATHAN S. STEINBERG, M.D.

We're now ablating, this is the second lesion, which is adjacent to the first lesion that we made. Once again, if you look on the left hand panel, that's what the recordings looked like as we started the burn, and on the right panel is the recording taking place now. You can see on PV 4, which is the fourth pair of electrodes on the mapping catheter, the electrogram is fairly large and is early in the sequence of activation. When we look over her, you can see that the PV 4 has become very small and PV 5, which is the next pair of electrodes, that that electrogram has shifted much later in sequence, so that means that we have blocked entry into the pulmonary vein during sinus rhythm right at that site. We have altered the sequence of electrical activation into the pulmonary vein. The goal of our procedure is actually entrance block into the pulmonary vein, but what we're ultimately trying to achieve is exit block from the pulmonary vein, because that's where the triggers of atrial fibrillation come from.

GRAPHIC

Ablation procedure for AF:

1. Pre-procedure CT scan to evaluate PV anatomy.

2. Double transseptal puncture using intra-cardiac echo guidance.

3. Anticoagulation of patient after transseptal puncture to prevent thrombus formation on catheters.

JONATHAN S. STEINBERG, M.D.

So, we had made some progress. It will take a number of lesions to achieve complete electrical isolation. So we move through this very methodically, very systematically, identifying each and every early site until all have been successfully targeted. That ablation is over, so we're going to once again look at the map that we have and we have made everything lighter in the bottom half of the recording, over here. You can see my arrows indicating the delayed segments. It looks like we're still early in the 3-4 range, so we've taken care of one connection, but there's probably another connection right there, so we still want to target the 3-4 area.

So Dr. Vloka is moving the catheter around to try to pick up the right site, based on what I observed over here, and I'm going to be watching for the actual recording from the tip of the catheter relative to the entire activation sequence, which is on the lasso catheter.

MARGOT VLOKA, M.D.

That's ablated. That's at 4.

JONATHAN S. STEINBERG, M.D.

Hold that. That looks good. Hold it there, please. We found the site. I'm looking on my cardo system. I can see that this is right between the two sites. You can see the two blue dots and we're right in between them, and hopefully that's an appropriate place. Now PV 4 is gradually going away here, not completely away yet. Also, we have now made PVs 1, 2, and 3, the recording from there, they have all shifted late, so we have, in fact, made everything delayed. We haven't gotten rid of all the recordings yet, but everything is beginning to delay as we, bit by bit, get rid of all the connections to that pulmonary vein. The entire sequence is now delayed. That was a good site. Contact was good. It's very important for us to maintain good communication of the ablation catheter with the pulmonary vein tissue so that the lesion we make is durable. After a successful procedure, the recurrence rate of atrial fibrillation is relatively low. About 20-30% of patients will have atrial fibrillation. Again, some of those patients will have it only in the first few weeks and then the atrial fibrillation will go completely away as the inflammation and the lesions heal. Others, about 20% of patients, continue to have atrial fibrillation. About half of those, we can go back in on and completely eliminate atrial fibrillation for good. Most patients, however, require only a single procedure.

AVI FISCHER, M.D.

Two more questions which can be answered quickly. One question is, “How long, approximately, does the procedure take?” The second question is, “How many patients have had this procedure here at St. Luke’s and what has been the success rate?”

The procedure itself takes several hours, depending on anatomic differences between patients and really identifying all of the focal triggers for atrial fibrillation. We’ve been doing this procedure for several years. We’ve done over 250 of these procedures and the success rates are about 79% for total freedom from atrial fibrillation, so that would mean patients are no longer on medications and do not have any atrial fibrillation. As Dr. Steinberg mentioned, there are some patients who do have recurrences and some patients who do require anti-arrhythmic medications after the procedure. Including those patients, the success rates are in the 80% range.

JONATHAN S. STEINBERG, M.D.

We’re in the process of repositioning our lasso catheter. It slipped out of the vein and now we have picked a target point. It’s going to be PV 10 here, which is now the earliest site. (positioning lasso) Here we are. We’re right at our target site and there’s good contact. We can get a sense of contact from some of the measurements that come off the tip of the ablation. You can see that the electrograms are beginning to fractionate as the burn is delivered. Across the upper portion of our recording screen, it really very clearly has become double fractionated in most of the recording electrodes. There’s greater and greater delay as the burn goes on. Again, it’s best appreciated if you look at the recording as we started, right here, and compare it to the recording at the present time. The fact that things are delaying and fractionating means we’re again severing another connection at the left atrial and pulmonary vein junction, in this case, of the right upper pulmonary vein. We’ll complete this lesion and then we’ll identify the next site, which will probably be just adjacent to it. Again you see on the cardo image, we’ve done an inferior segment and now we’re at a more superior segment of the pulmonary vein.

When I’m analyzing the recording, I can see that these have all gone late and I still have an early point at my reference point PV 1 and 10, which are right next to each other. We’re going to do a lesion right here. We’re right at 1-10. You can see the artifact on PV 1 and 10, so we moved our catheter to the right place. PV 1 has gotten late again and PV 10 is now gone, so we segregate another connection there. Again, it’s best appreciated by comparing the before the after images. Here’s the recording that’s gone. This one was early and is now late. So we’re gradually getting to the point where everything may go away and we can maybe move over to Dr. Fischer for a moment to do an email.

AVI FISCHER, M.D.

I have a few questions that I can answer. One question is, “Would this procedure work on paroxysmal atrial flutter?”

Good question. Atrial flutter is another abnormal heart rhythm that’s very frequently associated with atrial fibrillation. This procedure that we’re performing today is actually for atrial fibrillation and not atrial flutter. There are, however, ablation procedures that we perform frequently for atrial flutter. Patients do not need to be in atrial flutter at the time of the ablation procedure and the ablation procedure is highly successful, with cure of atrial flutter in greater

than 90% of cases. The ablation for atrial flutter occurs on the right side of the heart. No transseptal punctures are needed, like in this procedure. It's a procedure, once again, that we perform routinely here with very high success rates.

Another quick question that I can answer: "Is this procedure performed under full anesthesia or only with light sedation?"

This procedure we perform not under general anesthesia, but under what's called conscious sedation. Patients are made comfortable and given a variety of intravenous medications so that placement of the catheters and venous access are not uncomfortable and difficult. Throughout the entire procedure, patients are comfortable. We really tailor the amount of sedation we give as to the patient's discomfort, but we do not perform this routinely under general anesthesia.

We'll check back in with our live broadcast here.

JONATHAN S. STEINBERG, M.D.

We are moving to a different segment of the vein. Let's move the catheter over to our preferred site at PV 4. Looks like we're right in line there, so we're going to do a lesion there. Again, on the cardo we can see we're at a new position and once again we're starting to see things change. It's almost completely gone, with very minimal residual recordings now left in the pulmonary vein. In fact, it looks like everything is now gone. I think you can appreciate here, there's nothing left recorded. This is when we started this particular lesion. The pulmonary vein is now isolated completely. We'll complete this lesion and then we'll double check to make sure we've gotten everything within the vein, but I think you can easily appreciate that this vein is now electrically quiescent, as all connections to the left atrium have been severed, so there is complete entrance block into the pulmonary vein.

GRAPHIC

Candidates for PV isolation procedures for AV:

1. Paroxysmal or persistent AF.
2. Symptomatic and refractory to medication.
3. Lone AF or mild/moderate CV disease.
4. Frequency of atrial ectopy or AF not important.
5. Patient preference.

JONATHAN S. STEINBERG, M.D.

That isolation took six lesions and probably no more than about 40% of the circumference. Sparing as much of the circumference as possible is a critical strategy in order to avoid one of the complications of this procedure, pulmonary vein stenosis. I think the other important element is staying away from ablation within the pulmonary vein, either ablating at the ostium or within the left atrium, and then your pulmonary vein stenosis rates can be under 1%, as in our experience.

We look clean, so what we're going to do is move the ablation catheter out of the vein and we're going to pull back on that mapping catheter.

Let's pull back on the lasso now. We're going to watch carefully to make sure there are no residual recordings at the collar of the pulmonary vein. We've clearly illuminated all the distal conduction and now we want to make sure there's not anything left at the very opening of the pulmonary vein, so we'll pull back the lasso until it pops into the left atrium.

MARGOT VLOKA, M.D.

The ablation catheter is placed more distally in the vein and then pulled back. Out.

JONATHAN S. STEINBERG, M.D.

Okay. So now we're in the left atrium and you can also begin to see it on the ultrasound image. You can see the catheter is in the left atrial cavity. We now have some fractionated left atrial recordings, but we're clearly far away from the pulmonary vein. I'll just double check on my recording here to make sure that there was nothing. You can pick up on the motion artifact of the catheter. This is as it flicks out into the left atrium here. We're recording within the left atrium and you can see that here there was no indication of any residual pulmonary vein potential, so we have now successfully isolated the left common vein and all the more distal left-sided veins, and we've done the right upper pulmonary vein. The most likely trigger sites of atrial fibrillation come from the upper veins, so we have taken care of the most likely trigger site.

The last thing we'll do is the right lower pulmonary vein. This is the one that is hardest to map because it comes off at a very acute angle to the left atrial wall and it's often impossible to put the lasso mapping catheter in and sometimes we just have to map with the ablation catheter alone. This vein tends to be the least likely trigger site and have the least amount of muscular tissue within the vein and tends to require the fewest number of lesions for successful ablation and isolation.

Throughout the procedure, we're administering intravenous Heparin and keeping the patient fully anticoagulated while we're inside the left atrium. We will monitor the ACT every few minutes and adjust the Heparin accordingly. When the procedure is completed, we will allow the Heparin to wear off and take the catheters out and we will place the patient on low molecular weight Heparin and Coumadin, and low molecular weight Heparin is discontinued when the Coumadin or Warfarin becomes therapeutic. All patients are anticoagulated for one month after the procedure. Patients who have higher risk of thromboembolic events will be anticoagulated much longer than that, until the success of the ablation procedure becomes clear.

We'll move over to Dr. Fischer to answer some more emails.

AVI FISCHER, M.D.

Here's a question: "I had an ablation for atrial flutter five years ago and it was successful. I am now experiencing atrial fibrillation. Can this procedure be done after the flutter procedure?"

This procedure absolutely can be performed after an atrial flutter ablation. As I mentioned previously, the two arrhythmias are frequently associated with one another and, even though a

flutter ablation has been performed and the patient has been cured of atrial flutter, very often patients still experience episodes of atrial fibrillation. We do perform this procedure in those patients even after a flutter ablation.

Another question: "After the procedure, what sort of maintenance is needed?"

Some of the maintenance after the procedure, Dr. Steinberg alluded to. It relates to anticoagulation of the patient after the procedure. We routinely give patients low molecular weight Heparin and Coumadin after the procedure. Additionally, patients often are continued on anti-arrhythmic agents for a short period of time after the procedure to allow and to promote what we refer to as remodeling that occurs after the procedure in the atrium. However, the aim long-term is to actually have patients cured of atrial fibrillation and off of their anti-arrhythmic agents.

I'm going to find one more email question that we can try to answer. "How long do I have to stay in the hospital for this ablation procedure?"

In general, patients come from home the day of the procedure. They have the procedure performed. They are treated with the blood thinners after the procedure, low molecular weight Heparin and Coumadin, and patients most often go home the following day after the procedure.

At this time, I'm going to go back to Dr. Steinberg.

JONATHAN S. STEINBERG, M.D.

We're almost done with our procedure. We just have to mop up this last pulmonary vein. We'll be done in a few minutes. I want to thank my colleagues, Drs. Fischer, Arshad*, and Vloka, for helping out during the procedure, and for our wonderful nursing team, and we appreciate the patient's cooperation as well. Thank you all for attending this procedure. We appreciate it.

AVI FISCHER, M.D.

At this time, I'd like to reiterate, we'd like to thank you for tuning in to this webcast. The archived recording of this will be available on the website shortly. For more information, you can also log onto www.arrhythmia.org, which will give you more information about this procedure. Once again, thank you very much and goodbye from St. Luke's-Roosevelt Hospital Center in New York City.

NARRATOR

This has been a live nonsurgical arrhythmia treatment procedure using radio frequency energy, performed live at St. Luke's-Roosevelt Hospital in New York City. For more information, to make a referral, or to make an appointment, click on the buttons below.