Brian Olshansky:

Welcome to the American Heart Association podcast entitled, A Stepwise Approach to a Patient With Palpitations, Patient Empowerment, and the Use of Wearables. My name is Brian Olshansky, I'm a simple country electrophysiologist. On this podcast, we'll investigate the case of a 50-year-old female with palpitations, chest discomfort, and shortness of breath. We will discuss diagnostic options in someone without previously diagnosed supraventricular tachycardia. We will consider interventions patients can do at home, in other words, to treat the problem. We will consider the role of new therapy for supraventricular tachycardia. We will consider benefits and limitations of wearables as part of clinical practice.

I'm here today with an illustrious group of experts who manage patients with supraventricular tachycardia routinely. I'm thrilled to introduce to the panel, Dr. Zachary Goldberger Dr. Wendy Tzou, and Dr. James Ip. Zach, please introduce yourself.

Zachary Goldberger:

Hi, I'm Zach Goldberger, Professor of Medicine at the University of Wisconsin in Madison, Wisconsin.

Brian Olshansky:

Thank you, Zach. Wendy, please introduce yourself.

Wendy Tzou:

Thank you, it's an honor to be here. I'm Wendy Tzou from the University of Colorado, Director, VP and Professor of Medicine.

Brian Olshansky:

Thank you, Wendy. James, please introduce yourself.

James Ip:

My name is James Ip, I am a Professor and an Electrophysiologist at Weill Cornell Medicine in New York City. And I'm happy to be here and look forward to discussion.

Brian Olshansky:

Wow, we have a very impressive group here today. The views and opinions in this activity are those of the speakers and reflect the synthesis of science. Content should not be considered as the official policy of the American Heart Association. This educational activity is supported by Milestone Pharmaceuticals.

So, let's get right into the case. This is a patient of mine, her name is Cindy Jones, that's not her real name, though. A 50-year-old athletic, otherwise healthy woman with a history of hyperlipidemia, pre-diabetes, and pre-hypertension. She presents for evaluation of episodes of chest tightness, abrupt shortness of breath, and a pounding sensation in her neck that lasts up to two hours and occurs at increasing frequency over the past few years. Sometimes she needs to lie down as she feels like she is going to pass out. Deep breathing seems to stop the episodes, but once she actually stood on her head to get the episode to stop. Episodes sometimes occur after she jogs just two miles. Her first episode occurred when she was pregnant 15 years ago. She does take a statin. During one long episode, her husband drove her to the local emergency room, but the episode stopped on the way to the hospital.

In this initial evaluation in clinic when I saw her, an electrocardiogram was normal. She had a subsequent echocardiogram and stress treadmill that were both normal. She was able to exercise on the treadmill to stage five, the maximum sinus rate was 145 beats per minute. She was given an event monitor for four weeks that showed occasional PVCs and PACs, but they were not symptomatic. She had no symptoms during the monitoring period.

Wendy, I wonder what you think the next step should be in her management.

Wendy Tzou:

Well, I think this is a pretty common scenario that we encounter. And I think the most critical piece to this, especially if we're considering the different treatment modalities, is to kind of get a better idea of what the diagnosis is. We have some idea based on the fact that she seems relatively healthy and she had a really relatively early onset in adulthood of symptoms, that this is probably SVT, and especially the response to some maneuvers that she's just figured out on her own. But it would be nice to get a diagnosis.

The event monitor, not that surprisingly didn't capture anything even though she wore it for a month, just because many times these episodes, even if they occur in spurts, may go months between without capturing anything. And so it's not uncommon for someone like this, especially if they've already undergone a decent period of ambulatory monitoring, for me to suggest or ask, because this is increasingly common, if they already have some sort of a smartwatch that can at least track heart rates. Because that can sometimes be helpful, even just the heart rate information, but even better if it can record a tracing.

Brian Olshansky:

I completely agree with you, Wendy. Now, one thing that you pointed out is that the smartwatch may be helpful. I also felt that she may have SVT based on some of the palpitations she felt in her neck. Sometimes I see people with AV nodal reentry where the atria are contracting at the same time as the ventricles, where the pounding in the neck is a giveaway that it could be AV nodal reentry. Thank you very much for your very detailed response.

James, how would you evaluate this patient at this point?

James Ip:

Well, I think she's already had the initial evaluation started. I think that it's very good to get a baseline electrocardiogram if we're thinking about some sort of supraventricular tachycardia. Look for clues such as a delta wave on the EKG. If she had an echocardiogram look for any structural disease that could be associated with some accessory pathways like Epstein's or some maybe hypertrophic cardiomyopathy.

And then, as Wendy was saying, getting the recording is critical for this. There are many patients that have a history of palpitations, but they may just feel their heart is pounding stronger rather than faster. So, really determining that symptoms are due to a fast heart rate is important. Ideally, we can get a tracing or recording during symptoms whether it's from their smartwatch or from getting an EKG in the emergency room. If they happen to be able to get that, it becomes important and critical.

Brian Olshansky:

Yeah, those are all great points, very important. But as you mentioned, one of the critical issues is to really find out exactly what the rhythm is at the time of her symptoms, but we don't have that unfortunately at this point. So one of the issues is, as we're doing the evaluation here, we have to think

about, should we allow her to do everything she's already doing or should she restrict some of her activities? Zach, do you recommend that she exercise?

Zachary Goldberger:

Brian, I think it's important for patients not to restrict themselves. This is a very common situation. The more that patients recognize that if we're thinking about this as SVT, it is rarely life threatening. So I never have a patient restrict themselves from activity or change their diet or do anything based on these episodes.

Oftentimes patients will feel like they should modify their behaviors, they say, "Should I stop drinking caffeine? Should I stop doing exercise?" And I say, "No, I would not do that." However, if you find that there's a trigger for this and the patient oftentimes understand that what they're doing actually provokes these episodes, I would certainly say, "You probably shouldn't do that," but honestly, I don't ever say, I would never recommend to anybody really, to stop exercising based on these episodes of palpitations like the SVT.

Brian Olshansky:

Zach, I completely agree with you. I mean, I don't think we should have her limit anything that she's doing, but I do agree also that if she is having episodes and she is feeling poorly during the episodes, that she should avoid the things that are creating the problem.

On the other hand, I think we've got to come to a point of making a good diagnosis. There really isn't anything we can treat at this point because we don't know exactly what we're dealing with. Wendy, what would you do about this? Would you recommend any medication? Would you recommend a non-pharmacologic approach or any specific further testing at this point?

Wendy Tzou:

It's a good question. So, ongoing use of conservative measures such as vagal stimulation, especially since they have been effective, should be encouraged and may be in other cases an intermediate or long-term solution, particularly if episodes are relatively rare. This does not seem to be the case for this patient, and more frequent episodes as described are likely to affect quality of life, and these maneuvers, important to remember, do not prevent subsequent recurrence. Therefore, medications, starting with beta blockers or calcium channel blockers for suppressive therapy could be considered. As needed use of these or stronger anti-rhythmic drugs can also be considered. However, those available are at least currently only oral in formulation and take time to absorb, possibly more time than the episodes in questions seem to be lasting. Therefore, scheduled use would likely be more useful in her case.

Frankly, at this point, given the frequency of episodes and reasonable confirmation of the diagnosis based on non-invasive tracings, EP study and ablation would be reasonable to offer, given relatively high rate of cure and low risk of serious complications.

Brian Olshansky:

I think those are all very reasonable points, and we're going to get back to this whole idea about an EP study a little bit later. But she really is not interested in having an invasive procedure at this time. She's also a little bit suspicious about medications because at some point in time years ago, she had an allergic reaction to some antibiotic and she just doesn't want to take medications if she doesn't have to. But she

does want a diagnosis and at this point she's getting frustrated, so she takes matters into her own hands and she buys a smart watch. Zach, do you think this is a medically sound approach?

Zachary Goldberger:

You know I think that it actually is. I think that oftentimes if patients are able to be able to afford smart watches or a cardio device, it actually helps a lot because I think that this is a very classic story. Right? Patient's just had the episode and it's just not captured. A smart watch actually enables you to actually have a captured arrhythmia, have a heart rate, and sometimes the smart watch actually gives you a tracing. So I think this is actually a very useful approach for someone who's having very infrequent episodes, very symptomatic episodes. It actually kind of may help you get toward a diagnosis, which is actually really important, as far as for overall long-term management, because it could be one thing, it may not even be SPT for that matter. So I think it's actually very useful in this situation to have a wearable, if it's financially acceptable to the patient and they understand how to use it.

Brian Olshansky:

Zach, you raised important points, and you also raised the point that we live in a different time now, because years ago we didn't have wearables like this, but now we do. And I think where things are going to change is, patients are engaged in their own therapeutic intervention based on their own diagnoses. So I wonder, James, do you recommend this approach for your patients?

James Ip:

Yeah, definitely. I actually have a quick story about how I bought my father a smart watch one year, actually a number of years ago. I put it on him, and all of the sudden, his heart rate was 125 beats a minute. I was actually skeptical of this but then I started noticing a pattern, it was one of these smart watches that monitors his pulse. Sometimes he would start noticing he'd have some chest pain with it.

One time, just as your patient told in her story, I was trying to drive him to the emergency room to get his EKG, but of course, the SVT terminated before we get there. So then I got one of these ECG recording devices, as Zach mentioned, one of these intermittent, non-looping ECG monitors that patients can get for under $100, to record. And using that, I was able to diagnose that he did have SVT. And so it kind of comes around full circle being an electrophysiologist, but it's nice to see how these tools that patients can get are readily available, can provide data to diagnose a patient's SVT.

Brian Olshansky:

Really, really interesting. I think we're going to see more and more patients like this. Wendy, in your practice, have you thought about this and what do you think about the advantages and disadvantages of self-monitoring for a patient like this?

Wendy Tzou:

I totally agree that it is increasingly integrated into just our regular practice, specifically for all the reasons that we've talked about already, how difficult these episodes can be captured formally. And so yes, I like it a lot for that reason. It does though, tend to introduce a lot more data that kind of is on us to interrogate and assess, because the diagnoses or the possible AFs, possible tachycardias that are stated by the applications on these wearable devices are not always accurate e. And sometimes just frequent PVC is frequent ectopy. I mean, this is kind of not SVT, it's in the realm of AFib, but similar kind of concept. So it's just a lot of information that sometimes has to be filtered through.

That being said, I think that just the snapshots that can be captured by the patient real time and then uploaded into their chart that we can look at directly, has been really helpful in helping to guide management in these patients.

Brian Olshansky:

Yeah, I think you're right, but I also think, as you said, the onus is going to be on us to now deal with a huge amount of information we never had to deal with in the past.

Now, Zach, I have a question for you. You mentioned that this is a medically sound approach, but do you think that over-the-counter monitoring tools can actually provide really valid data?

Zachary Goldberger:

That's a great question. I think that getting back to what Wendy was saying, we have a lot of monitoring data now. I think that honestly, I think that most of it, what I see is oftentimes non-interpretable. It's noisy, it's hard to say what it is, whether it's a regular narrow complex tachycardia or AFAM, it's very hard. But I think that the value here is actually knowing exactly what the heart rate is when the episodes are happening. A heart rate of 170 is different than a heart rate of 110, and some of these watchers actually are able to, it may be just difficult to sort of understand what the rhythm is based on that, but certainly the sudden onset and offset of these things going from a heart rate that's normal up to a very rapid heart rate, that is by definition a paroxysmal tachycardia. I find that that's oftentimes the value, is actually knowing what the rate is and the cadence of it, more so than what the strips may actually show.

Brian Olshansky:

Yeah, I think you're right. But I think the information we can glean from this is collaborative and it helps us with our own getting a good history from the patient and listening to a lot of the nuances of the patient's presentation. So I do think that there is a value in these wearables.

Do you think there's a difference between, let me ask James this question. Are there differences between different wearables and self-monitoring devices?

James Ip:

Yeah, I mean, I think there are differences in some of the technology. So there's the PPG or photoplethysmography, that some of these smart watches have, that little green light on the back of their watch that presses against the skin to detect what their heart rate is. Some of those, of course, are accurate when the patient's at rest, but of course if they're moving around then those heart rates can notoriously be inaccurate and you have false readings. And so, as we've all spoken about here, the interpretation of it has to be considered in the situation that the patient is. If as my father had his wearable device you could see the sudden increase in his heart rate. And they can track it through time. If it suddenly starts and suddenly stops, the fast heart rate from under 60 beats per minute and then jumps down to the 160s, you can certainly see that that is a paroxysmal tachycardia.

And then one step beyond that is to get one of these EKG recorders. And so some smart watches have a feature that enables them to put their finger on the casing or the bezel to record a single lead EKG which has been mentioned previously. Or a little plate that's synchronized to the smart phone, that can help record a lead-one EKG. Sometimes that's helpful. I always tell patients that they should practice when they're in normal rhythm, when they're feeling well, so that they're ready to do a recording, and are prepared when they have SVT. They should keep their hands steady, keep the device on the table or

brace their hand if they're using a watch on a table to use their fingers. So the tracing is nice and steady instead of wavy and difficult to interpret.

There are these six-lead ECG recorders. Well, actually in this article I wrote in JAMA about my father's story, I had him use his right hand and his left toe to generate a lead-II EKG, and then you could see the P waves based on that tracing. So, these are very helpful tools. Sometimes people use blood pressure monitors to check what the pulse is. Of course, that could be inaccurate if they're in atrial fibrillation, but it may detect an irregular heart rate. All these things need to be validated with ECGs if we're just looking at heart rates alone.

Brian Olshansky:

Yes, I agree. And then we have an amazing array of new monitoring devices, and now many of them have built-in AI. So next thing we'll know is a patient's going to come in NPO waiting for their ablation because the AI told them they have SVT that needs to be ablated. We're not quite there yet, but who knows what's going to happen in the future. But right now, we do have these monitors that can be helpful. So Wendy, I was wondering, as we're discussing this particular woman, how would you handle a patient like this at this point in your practice?

Wendy Tzou:

Well, I mean, I think that she's reluctant to pursue too much additional therapy at this point. I think we can provide reassurance that it's probably not a malignant issue. Outside of the one episode of near syncope for which ensuring adequate hydration, etc, might have helped. I think that monitoring with a device like this would be reasonable. And if she captures something and or the episodes happen more frequently, then I think a greater argument towards providing some type of therapy, be it medication or invasive, would be reasonable too.

Brian Olshansky:

Great. Well, she decides to kind of wait things out and several months later she has another episode. This one lasted about an hour, she got really concerned about it. She didn't feel well at all, and she recorded it. And she mentions it in her electronic medical record, and then she wants an urgent appointment to be seen. So, she came in with the recorded episode and it showed a narrow QRS complex tachycardia without obvious P waves. The rate was regular, it was 175 beats per minute. The episode stopped spontaneously, but the initiation and termination of the episode were not recorded. So this looked like SVT to me, but I'd like to hear from Zach exactly how he defines supraventricular tachycardia.

Zachary Goldberger:

So it's very important to understand what an SVT is. It's a fast rhythm, starts and stops, suddenly. perpetuated in the His bundle or above. On history and on the ECG, there's an abrupt onset and termination. This is generally distinguished as sinus tachycardia, which is also technically an SVT, given that arrhythmia, which is above His bundle bifurcation as well.

So when we think about paraxial, SVT, has to be regular and rapid, a sudden onset and termination. This should be distinguished from Afib, and by definition, Afib is an SVT. Because it comes above the bifurcation of the His bundle, but that tends to be regular. It's not a precise diagnosis, the SVT, but it's really a subtype of now a complex tachycardia, which is paroxysmal in nature.

There are three major types of paroxysmal SVTs. One is atrioventricular nodal reentrant tachycardia, or AVNRT, that involves tissue in the AV node, pathways connected to the compact AV node. Orthodromic AV range tachycardia, involving the AV node and accessory pathway, which is distinctly away from that node. And finally, atrial tachycardia, which only requires tissue above the AV node to perpetuate.

Brian Olshansky:

Well, thank you for that clarification. Really appreciate it, Zach. But now with the information we now have, how would you manage her?

Zachary Goldberger:

So, I think that we have a tracing that shows that she's a narrow complex tachycardia without clear P waves. And so I think that that sort of leads us down the road of thinking, is this AVNRT, which is the most common of the PSVTs, or is it possibly an orthodromic reentry, which is a family of AVRT? And so you really don't quite know what it is at this point.

So at this point, I think that could just be very transparent with the patient saying, "Listen, I have a good idea of what this is. This is not life-threatening but it can cause symptoms and it can cause lightheadedness." And that's when getting back to what Wendy was talking about, there's options. Oftentimes it's conservative options, following it, knowing that it's not life-threatening. Patients want to get a little more data, get a little more monitoring. Or to go toward EP study, which is diagnostic and possibly therapeutic based on what the tachycardia is. And again, we don't quite know what it is, and so assimilation is a little more straightforward than others. And again, we don't quite know until we get in there, but at that point, I think that we actually have a little more armamentarium saying, "This is good, Cindy. We actually have a good idea that this is one of the SVTs," and then we talk a little more in a format about what that is. And with shared decision-making, come to next steps.

Brian Olshansky:

I agree, and it's like Yogi Berra said, when you come to a fork in the road, you need to take it. We have two forks I think we have here. One is medical therapy, the other is EP study and ablation.

James, maybe you could kind of summarize some of the new things that are available in terms of medical therapy. What are, I mean, the old things and the new things and what would be available and how you would approach medical therapy for this patient.

James Ip:

Sure, yeah. I mean, medical therapy would be considered for patients who want to help control or reduce the frequency of these episodes. Taking a medicine to actually stop an episode does require them to go to the emergency room to get an intravenous medication, whether it's adenosine or a beta blocker, or a calcium channel blocker. With these medicines, since most of SVT as Zach so eloquently described, are involving the AV node, whether it's AV nodal reentrant tachycardia, or AVRT, with the pathway looping through a circuit, involving the AV node. If we give something that slows down conduction through the AV node, we could potentially affect the frequency or the perpetuation of the circuit.

And so right now we have beta blockers or calcium channel blockers in oral form, but for patients who have very intermittent episodes, it would be a matter of trying to take it every day. And sometimes if patients only have one or two episodes a year, they may not necessarily want to take a drug every day

to help prevent that. Some of these medicines are also associated with fatigue, constipation, although they're very common medicines to treat high blood pressure, so they're quite safe to take. Taking a pill, as a pill-in-the-pocket approach, as some people may think of as taking a pill only when they're in the SVT, does take about 30 to 60 minutes for an oral pill to be absorbed in the stomach to act on the heart. So, there's a bit of a delay there. Some studies that looked at this, which are decades old from the 1980s, only involved a handful of patients. So, I generally don't prescribe that to my patients.

I am looking forward to this new therapy that's being developed as an intranasal calcium channel blocker. So instead of waiting for the absorption through the stomach and entering the bloodstream, the drug is sprayed into the nose. It's rapidly absorbed through the nasal mucosa, and can achieve peak plasma concentration within about seven minutes. And in a number of studies called the NODE trials, which I've been very intimately involved with, we've been able to show that this drug was safe to take, didn't cause very low blood pressure in patients who had it, and was able to terminate SVT quite effectively in multiple trials, even with repeat episodes. The latest one that was published in Lancet, showed termination rates of about 65% in 30 minutes, and about 75% within an hour. And no one had any heart block, syncope, fainting, or hypotension that was reported with some of these pill-in-the-pocket studies from long ago. So I've been looking forward to that. It's not FDA approved yet, but it's something that they're considering and hopefully will be available in the future for some of our patients who want to use that approach.

Brian Olshansky:

Well, thank you for all that tremendous information. And actually, I think we're in a new era now when it comes to managing patients with supraventricular tachycardia.

So I wonder, Wendy, what do you think the role is going to be as we emerge with some new therapies and new ways to diagnose patients? What do you think the role of electrophysiology study and ablation is in patients with diagnosed supraventricular tachycardia or suspected supraventricular tachycardia?

Wendy Tzou:

I mean, I think it plays a role with respect to essentially definitive therapy, especially for the subclasses that we've talked about specifically, AVNRT, AVRT, and some atrial tachycardias. These medications and short-acting, perhaps rescue therapies are certainly of great value, and I'm very excited to see this potentially introduced into more regular clinical use, but it doesn't take care of the problem forever.

So, ablation theoretically can and usually does. I mean, there's even, although not very many trials about this, there is a randomized control trial comparing ablation to anti-arrhythmic drug therapy, which over a five-year period showed clear superiority of ablation over medical therapy, and this is continuously administered medical therapy. At some point, especially if episodes progress to the point that they're happening somewhat frequently, like multiple times a month, multiple times a week, there's limits to what the kind of as needed therapies can offer. And so that's where I think EP studies still plays a role.

And additionally, kind of to add to the discussion about what other, knowing what we're treating, that Zach had brought up. And if you never capture it, EP study would certainly identify that and redirect treatment in that situation.

Brian Olshansky:

So Wendy, for the audience, maybe you can explain a little bit about what an EP study is, some of the risks and benefits, and what you're actually trying to do when it comes to ablation.

Wendy Tzou:

An electrophysiology study or EP study, is an invasive procedure performed in the EP laboratory in which catheters containing specialized electrodes are introduced into the heart so that the diagnosis and mechanism of arrhythmias, including SVT, can be most definitively determined. The electrophysiologist can induce arrhythmia and record the heart's electrical activation using the catheter electrodes. Sometimes medications may be infused to assist with arrhythmia stimulation. With catheters positioned in various locations in the heart, the cause for the SVT can usually be localized, targeted, and ablated with a high degree of success, all within the same procedure. The same is also true for other arrhythmias. Ablation can be achieved using radio frequency or heating, energy freezing, or other modalities which are still in development.

A few caveats about the procedure are that the arrhythmia in question may not be inducible, or the arrhythmia induced may be non-clinical may confound then subsequent therapy. Additionally, while infrequent short and long-term complications may result, which may in some small number of cases even require a pacemaker to be implanted. All-in-all, catheter ablation for SVT is generally safe with a favorable benefit-to-risk ratio and can offer a permanent solution.

Brian Olshansky:

Thank you, Wendy. This has been a fascinating discussion we've had today, and I want to thank all the participants today for being part of this activity. We discussed many important points. We discussed the symptoms and the evaluation of a patient with suspected supraventricular tachycardia, some of the novel approaches using wearables. We've also discussed some of the novel therapies that are going to be available to our patients with supraventricular tachycardia. So, more to learn as time goes on but I think this has been just a great session of discussions about the key issues of a patient of mine and really helpful in helping me understand what everyone thinks about how to manage a patient with suspected supraventricular tachycardia.

So, thank you again. And for more on this and other cardiac topics, please visit Learn.heart.org. Thank you very much for participating in this session.

Wendy Tzou:

Thank you.

James Ip:

Thank you very much.

Zachary Goldberger:

Thank you.