Dr. Christine Jellis (00:17):

Welcome to the AHA Pericardial Podcast, titled: Complications of Acute Pericarditis. This is the second of a series of podcasts from the American Heart Association, recurrent pericarditis initiative. I'm Dr. Christine Jellis, associate professor and vice chair of the Heart Vascular and Thoracic Institute at Cleveland Clinic. I'm an imaging cardiologist and co-director our Pericardial Center. Today, I'm thrilled to be joined by two special guests with expertise in the field of pericarditis.

Dr. Christine Jellis (00:49):

The first, Dr. Tim Simpson MD, PharmD, is senior cardiology fellow at Oregon Health and Science University. He holds a doctor of pharmacy degree with expertise in cardiovascular pharmacotherapy with clinical interest in the role of inflammation in cardiovascular diseases. He serves as a member of the AHA Clinical Pharmacology Committee.

Dr. Christine Jellis (01:12):

Our second guess Dr. Sadeer Al-Kindi MD, is an assistant professor of medicine and radiology and Wolf family scholar at Case Western Reserve University and an attending cardiologist and medical director of the Cardiovascular Phenomics Core at university hospitals. He has interests in studying inflammatory risk and cardiovascular disease. Today over the next 30 minutes, we will discuss the causes, complications and some treatments of acute pericarditis. We will also explore how we can hopefully prevent an initial episode of acute pericarditis from evolving into incessant or recurrent pericarditis. So let's begin the conversation. To frame our discussion, Dr. Simpson, would you like to define what is acute versus incessant versus recurrent pericarditis for us?

Dr. Tim Simpson (02:05):

Absolutely. And that's a great question to start in framing our discussion today about acute pericarditis. And so we know as was covered in the first podcast very nicely that an acute presentation of pericarditis typically presents the diagnostic criteria, meaning two of the four typical criteria of chest pain, a rub, ECG changes and/or pericardial effusion. And to be an acute episode, it typically should last less than four to six weeks.

Dr. Tim Simpson (02:31):

For some patients, unfortunately, symptoms persist beyond that four to six week period, but last less than three months. And that is defined as an incessant pericarditis. Once we've reached greater than three months of symptoms, then we typically will classify it as a chronic pericarditis. For some folks once we do get resolution of their pericardial inflammation, we have a symptom free period of greater than four to six weeks but then they progress to have a recurrence, that's when we define it as recurrent pericarditis.

Dr. Christine Jellis (03:01):

Fantastic. That's a great overview to really set the scene of what we're going to talk about today. I'd like to focus initially on acute pericarditis, because I think this is something that we often see in our emergency rooms, and we often get questions about how can we avoid triggers for acute pericarditis. So Dr. Simpson, initially, what are potential triggers for acute pericarditis? And perhaps then we'll ask Dr. Al-Kindi to jump in with what can we do to prevent acute pericarditis?

Dr. Tim Simpson (03:33):

Yeah, that's an important question. The etiology of pericarditis really depends on in part the epidemiologic background that you're looking at. What patient population you're caring for and in what setting. Is this a clinic patient or someone you're seeing in the emergency room for acute chest pain? One of the real challenges and I think professionally rewarding things of caring for this group is that it's a fairly large differential. And so across the board, by in large in developed countries, idiopathic or presumed viral pericarditis remains the majority of cases.

Dr. Tim Simpson (04:05):

Autoimmune is fairly common as well, often in the setting of a systemic illness or process. Sometimes it can present as the first presentation of a systemic illness. Malignancy remains very common. Traumatic and iatrogenic, and this can be things like cardiac surgery which we'll talk about. Sometimes our EP ablations, radiation or trauma. And there still are some metabolic arrangements that lead to pericarditis like uremia. And then there are less common, more rare things like bacterial infections, drug-related with hydralazine, some of our chemotherapy agents can also be rare etiologies. It's important to note worldwide that in developing countries, TB still remains the number one cause of pericardial disease as well.

Dr. Christine Jellis (04:49):

So when we think about that laundry list of causes of pericarditis, Dr. Al-Kindi, what can we do to try and prevent this happening? Both for our patients and also ourselves?

Dr. Sadeer Al-Kindi (05:00):

Thank you for that question. I think just following up on Dr. Simpson's laundry list of basically identifying the causes, a lot of these causes can be preventable. So we're talking about tuberculosis, for example. Avoiding the usual triggers and risk factors for tuberculosis will eventually lead to reduction in TB pericarditis. But I think when it comes to the United States where post-pericardiectomy is a major cause of pericarditis, which has been to a certain extent, has been the most studied pericarditis when it comes to interventions. I think there has been a lot of advancement in the field over the past two decades. And now we have a good data to suggest that colchicine as a preventive therapy for these patients going forward. So multiple randomized, larger randomized clinical trials have shown that colchicine, when it's given early postoperatively, can cut the risk of post-pericardiectomy pericarditis by half or more than half.

Dr. Sadeer Al-Kindi (06:02):

And there is also some data to suggest that NSAIDs, when they're given preoperatively or early postoperatively, can lead to a reduction of pericarditis post-pericardiectomy, but these have not been widely studied to this point. I think there is an emerging epidemiology of pericarditis as a cause. And this is an emerging data here on with COVID, right? So COVID-19 infection has been linked with cases of pericarditis. And one may think that, yes, we have a lot of viruses that can cause pericarditis. Most of which are actually not preventable, because we don't have therapies for them - coxsackie and others. But COVID is one of the viruses that we actually can prevent fairly easily with vaccines.

Dr. Sadeer Al-Kindi (06:47):

And although I don't see that happening anytime in the future with randomized trials to look specifically at pericarditis as an outcome with vaccines, but it's fairly intuitive to suggest that if you prevent COVID-19 infection dramatically, then you are able to prevent COVID-19 related pericarditis.

Dr. Christine Jellis (07:07):

So it sounds like the preventative measures that we discuss related to COVID, things like hand washing, mask wearing, obviously vaccination for COVID and also influenza, we could say are also useful for the prevention of pericarditis of an infective nature.

Dr. Sadeer Al-Kindi (07:23):

That's exactly right.

Dr. Christine Jellis (07:24):

Thinking about prophylaxis of post-pericardiotomy pericarditis, often we're hesitant to give patients nonsteroidal anti-inflammatories after cardiac surgery, but would you like to comment on whether you are starting to see more patients being given routine colchicine postoperatively? Or if that's something that we need to have a low threshold to institute and be aware of patients who perhaps have pericarditis postop and start that sooner rather than later?

Dr. Sadeer Al-Kindi (07:54):

Unfortunately, in our center, we don't give colchicine routinely. And I don't know what data nationwide is. We don't give colchicine as a prophylaxis even in high risk patients. And I think it remains to be individualized by surgeon and by physician who's treating the patient. But there is very good data on really safety and efficacy of colchicine in preventing postcardiotomy pericarditis and also atrial fibrillation, postoperative atrial fibrillation, which it may be directly related to the pericarditis itself. So I think given the safety, I think there needs to be implementation of these proven therapies more broadly at different institutions and translating what we know from science into actual implementation.

Dr. Christine Jellis (08:41):

Thank you. It sounds like we have an opportunity there to really craft the practice moving forward. Dr. Simpson, we've touched upon therapies for prevention of acute pericarditis. I know our next podcast is going to be focused on treatment, but perhaps you would just like to set the scene if you will, for which drugs are recommended for treatment of acute pericarditis so that our listeners can anticipate perhaps the discussion for the next podcast.

Dr. Tim Simpson (09:09):

Absolutely. In general broad strokes, really anti-inflammatories are the cornerstones for acute pericarditis. And it's kind of been interesting to watch as our understanding mechanistically of inflammation has grown quite dramatically over the last two decades, kind of our armamentarium of drugs to treat pericarditis both acute and recurrent and chronic have also expanded very nicely. And to date, first line therapy for uncomplicated, acute pericarditis really remains an asprin or NSAID in addition to a weight dosed colchicine. This is based on several RCTs, the COPE and the ICAP trials for instance. This comes with the ESC recommendation and their guidance of a class one level A. And so that does remain the recommendation for first episode of acute pericarditis.

Dr. Christine Jellis (09:51):

For our listeners, just in practical terms, what doses typically do we start people on with respect to colchicine and nonsteroidal anti-inflammatories?

Dr. Tim Simpson (10:00):

It's a little bit unique in that the ESC recommended dose is not available in the U.S. They recommend 0.5 milligrams of colchicine. And actually it's weight based. And so 0.5 for those less than 70 kilos and doubling that for those greater than 70 kilos. And in the U.S., we have a 0.6 milligram, which is comparable and used in clinical practice here applying those same weight based strategies. As far as the NSAID goes, ibuprofen has classically been used. And the importance is that it's in really talking to your patients, that it's a scheduled regimen of ibuprofen. This is not an as needed ibuprofen which folks are typically accustomed to. And so it's often 600 to 800 milligrams three times a day in a scheduled fashion for a course of at least seven to 14 days for an acute episode.

Dr. Christine Jellis (10:47):

I'm so pleased you mentioned about the discussion and needing buy-in from patients, because I think that is really key that we need to make sure that they understand the commitment of regular therapy to treat this condition. So hopefully we can prevent it turning into the incessant and recurrent types of pericarditis that we've discussed earlier. So if we take a little step back and think about what we should be looking for when we see someone potentially with acute pericarditis, what are the clinical symptoms and signs that you think we should best look out for? Dr. Al-Kindi, I'll throw it to you first.

Dr. Sadeer Al-Kindi (11:25):

Yeah, I think it may have been covered in prior podcasts about the acute pericarditis and that typically the thoracic chest pain. And he may have signs and symptoms of tamponade physiology as well with the right sided pressures, hypotension. And you may hear muffled heart sounds. 12 lead EKGs may be instrumental to identify at least early changes when it comes to pericarditis and echocardiography obviously as a cornerstone of imaging when it comes to these patients. Chest x-ray and lab tests, including inflammatory cytokines and inflammatory biomarkers are also helpful.

Dr. Sadeer Al-Kindi (12:00):

But when it comes to recurrent pericarditis, these patients may actually present atypically compared with the acute pericarditis. There is some literature suggesting that patients with recurrent pericarditis, they have an atypical presentation. They're less likely to potentially have inflammatory cytokines elevated, at least when it comes to CRP and ESR. A smaller percentage of them would present with tamponade physiology and large paracardial effusions. Even if they had plural effusions and tamponade during their first presentation in the acute phase.

Dr. Sadeer Al-Kindi (12:36):

So there are some nuances when we think about recurrent pericarditis and patients coming back to us, and I think pleuritic chest pain is really something that we have to pay attention to and maybe do a little bit more imaging and advanced imaging. Utilize more advanced imaging in the workup of recurrent pericarditis. So we emphasize the role of imaging and cardiac CT comes to patients who present with the recurrent pericarditis, because they may not have your typical paracardial fusion. They may not have elevated ESR and CRP and so on so forth. And it does have implications for therapy. I may be biased because I'm an advanced imager and Dr. Jellis is as well, but we think about advanced imaging when it comes to these patients as a guide to really understand the risk and also understand the underlying pathophysiology for these patients and maybe define roles for heterogeneous patient population that may benefit from specific therapies.

Dr. Christine Jellis (13:35):

I completely agree, obviously we are drinking the same Kool-Aid when it comes to multi-modality imaging. But I agree that there's two groups. There's the acute pericarditis group who have the classic symptoms, the PR depression, the elevated inflammatory markers, perhaps the history of recent viral infection. And they're the ones as we've heard who are going to have the colchicine and the nonsteroidal anti-inflammatories and hopefully have a very short time course. And then for those unfortunate people who have a more protracted course and some of those markers perhaps become more normalized, I think we can only highlight the utility of cardiac MRI in that setting to really tease out that pericardial delayed enhancement that allows us to be certain that we are dealing with pericarditis as opposed to the multiple other causes of chest pain that we can see.

Dr. Christine Jellis (14:23):

I think I would definitely stress that that's where it's been really helpful for us to have a center of excellence in pericardial disease and have folks who are very familiar about the different nuances, the different therapies, the potential side effects, and also how best to use those multi-modality techniques to really tease out, firstly, does the patient have the disease? And then to look for the associated complications both of pericardial effusion, but then also as we'll discuss in a minute, think about things like constriction or effusive constriction that we may need to also consider and to treat.

Dr. Christine Jellis (14:58):

When we think about these complications of pericarditis, what are the first things that spring to mind when you see a patient in the emergency room? And I'll throw this to Dr. Al-Kindi first and then ask Dr. Simpson to comment. Thinking about how do we keep patients safe? What do we do to see if they have an effusion and what signs are we looking for on the echo that make us concerned that this is a patient who has tamponade physiology and perhaps needs to have that effusion addressed?

Dr. Sadeer Al-Kindi (15:27):

Yeah. Thank you for this question. I think for any patient who comes back pleuritic with chest pain, especially if they've had history of acute pericarditis, I think there needs to be a focus on detailed phenotyping of these patients with clinical assessment. As I mentioned, EKG echocardiography, and maybe some advance imaging as well. But I think there is an evolving role right now for point of care ultrasound, which is widely available and increasingly utilized in emergency department, to really and quickly identify whether there is a pericardial effusion that may have been missed using the traditional kind of workup, which could include clinical assessment and so on and so forth. And even on EKG and chest x-ray. And I think the broad availability of echocardiography or focus and the emergency department will help identify more and more patients and identify risk stratify them. I think when it comes to tamponade, which as I mentioned is much... I think literature suggests that it's lower rates when it comes to recurrent pericarditis.

Dr. Sadeer Al-Kindi (16:30):

Although there is a recent, nice paper, by Dr. Klein, your colleague in Jaha that looked into multicenter kind of study, that looked into the prevalence of tamponade in these patients and it showed it's about nine to 10%. So I think there is a non-trivial percentage of patients who come with cardiac tamponade, so it's very important to talk about how to identify tamponade in these patients.

Dr. Sadeer Al-Kindi (16:53):

I think classically tamponade is identified by elevated right sided pressure, so that's something that you can see on the IVC size and motion with the respiration. But also other signs of increased intrapericardial pressure, which could include RV collapse, RA collapse, or sometimes left atrial or left ventricular collapse depending on the situation, significant variation, respiratory variation in transvalvular velocities is another thing that we look into. And also identifying septal shattering or interventricular dependence, which may be a sign of additional construction that may be seen in these patients. So I think there's more role for additional testing as well. There's an evolving role for strain imaging and so on when it comes to identification of construction in these patients.

Dr. Christine Jellis (17:42):

I'll throw across to Dr. Simpson. So when we are in the emergency room, we've been called to see the patient with pleuritic type chest pain. Perhaps someone's done a point of care ultrasound showing an effusion. What sort of hemodynamics are you looking for to determine is this someone we need to emergently do a pericardiocentesis by the bedside? Or is this someone that perhaps we can all take a deep breath and then think about an elective tap or just observation with a followup echo? How would you approach this? And then perhaps we'll think about the various approaches that we could use for pericardiocentesis.

Dr. Tim Simpson (18:14):

That's a great question. And kind of in my initial assessment of someone coming in with a history of pericardial process or suggestion of the acute pericardial process, I think it kind of gets back a little bit to your ABCs, as just what is their hemodynamics at the time that you're assessing them? Are they hypotensive tachycardic? Are they maintaining okay? Are they warm in their extremities, et cetera. It's kind of your first pass assessment. And I think, especially in the pericardial process, I think there is still a role for a good clinical physical exam in these folks. And we mentioned a little bit of the rub, but you can also see the elevator right sided filling pressures. You can see Kussmauls if you're concerned about a constrictive process, the muffled heart sounds, et cetera.

Dr. Tim Simpson (18:55):

And then there's also a role of assessing for pulses paradoxus as well, which is a bit of a lost art. Some would argue that it's becoming increasingly difficult I think even to find just a manual single manometer in the hospitals these days. So, I think a well-defined, thoughtful clinical exam in these folks as they're coming through the emergency room can really help to acutely triage. Is this patient someone who we need to assess for a bedside pericardiocentesis? Do we have a period of stability that we can get them to a cath lab or to an EP lab where it can be done under a little bit more standard circumstances? Or is this somebody that we can watch and wait and talk, get some multi-modality imaging to further assess the etiology.

Dr. Christine Jellis (19:37):

And I think one key is knowing how pericardiocentesis is performed in your own center and who is the person that should be performing that procedure. And we have three of us here from different centers, so perhaps we can each give our backgrounds on who does that and the different approaches that are taken. So obviously if this is a patient who's acutely unwell with a big circumferential effusion, then that's going to be drained emergently by the bedside. But there are other approaches that might be taken in other scenarios. Dr. Simpson starting with you, what approaches are most and how would you a patient who needed a tap?

Dr. Tim Simpson (20:13):

That's a great question. It's always important to know who to call for help in the middle of the night in an acute setting. So at our institution, it's typically the interventional cardiologist doing the pericardiocentesis if the patient is stable enough either to wait at the bedside or to transfer to the cath lab. In other instances, we do have much of our critical care cardiology staff is trained in pericardiocentesis if it is going to be a bedside tap and/or some of the emergency room doctors have maintained competency as well.

Dr. Tim Simpson (20:40):

And then as far as our typical anatomical approaches, there are typically three approaches one can take. A subxiphoid and apical, and then less commonly a parasternal. It's operator dependent and it's largely dependent on the anatomy of the effusion and where is it going to be the deepest, where can we most safely perform a pericardiocentesis. And that's largely going to guide it, in addition to operator experience and expertise. So we'll typical do subxiphoid approaches and less commonly apical approaches.

Dr. Christine Jellis (21:09):

Dr. Al-Kindi, what's your approach at university hospitals?

Dr. Sadeer Al-Kindi (21:14):

Exclusively at university hospitals it's done by interventional cardiology in the cath lab. Even in emergency situations, the patients can be safely transferred to the cath lab, which sits adjacent to very close to emergency department, but also adjacent to all of our cardiology floors. So patients can go into the cath lab and get it done percutaneously.

Dr. Christine Jellis (21:33):

I'll give you our approach at Cleveland Clinic, which is that the imaging staff, the imaging cardiologists, tend to be the ones draining these effusions in patients who come in through the emergency room or in house and need to have it drained. And we typically take an apical approach using marking the spot with ultrasound and then draining it usually in the procedure room in the ICU, unless the patients particularly unwell. Obviously our colleagues in the EP lab and the interventional team in the cath lab also perform taps using fluoroscopic guidance in the cath labs.

Dr. Christine Jellis (22:06):

And then I think a really exciting evolution in pericardicentesis has happened over the last couple of years with our radiology colleagues who are increasingly able to assist us with doing CT guided pericardicentesis for those of fusions that predominantly posteriorly located which are difficult for us to tap either subcostally or in the apical position.

Dr. Christine Jellis (22:29):

And that's been really helpful, particularly for postop patients who often have more of a posteriorly located effusion. So I think it's nice to see there are different approaches all over the country and emphasize that seeking out the expert in your center is definitely advocated and they'll be the ones to help you out in the middle of the night, I'm sure. So when we think about the fluid that we drain, Dr. Simpson, there can be transudates, exudates, or hemorrhagic effusions. And thinking about what should

we send that fluid off for if we see a hemorrhagic effusion, does that change the differential that we are thinking about in terms of etiology of the pericarditis or pericardial effusion for that patient?

Dr. Tim Simpson (23:11):

I would say that pericardial fluid analysis has a relatively modest diagnostic yield. I would say in comparison to multi-modality imaging or sometimes an adjacent biopsy, et cetera. And so I think for us, at least pericardicentesis is most often a therapeutic intervention rather than a diagnostic intervention. There are some exceptions to that. If you're concerned that there's a perioral interbacterial pericardial process diagnostic pericardicentesis can be helpful.

Dr. Tim Simpson (23:38):

And then in talking about how do we do a laboratory assessment of pericardial fluid, one is you just visually assess it. And that can be very important if you're concerned if there's hemorrhagic transformation, for instance, you can see if the blood is coagulating. Sometimes on rare occasion, you'll get a chylous effusion for instance. And that's visually very striking. There's been some attempts at applying the lights criteria to the pericardial space.

Dr. Tim Simpson (24:01):

And I would say that's been relatively disappointing in that most of the pericardial effusions will be excitative in nature, about 80% by in large. And it doesn't strongly discern the etiology in any kind of consistent way. And so a malignant fusion can be excitative. It can also be transudative for instance. The one exception is probably tuberculosis, which is almost always excitative and it's classically the lymphocytic predominant excitative.

Dr. Tim Simpson (24:26):

Then additionally you can do things like ADA and PCR to really identify those folks. Your typical laboratory analysis will include your cell count, your differential, often a gram stain and culture if you're concerned that there could be an infective process. And then some of those subspecialty testing, including cytology, if you're concerned.

Dr. Christine Jellis (24:44):

So guys we're at the point that we've diagnosed the pericarditis. We've drained the effusion. We have got them on treatment. How are we going to prevent our patient from developing either recurrent pericarditis or the complications that we always fear in terms of constrictive pericarditis in the future? Dr. Al-Kindi, I'll throw across to you first.

Dr. Sadeer Al-Kindi (25:07):

Treatment of the acute pericarditis episode in a timely and a complete manner has been shown to decrease the incidence of recurrences. And we know this from the colchicine trials. If you do a proper course of colchicine, you can actually reduce the risk of recurrent pericarditis significantly. In cases where we do prolonged immunosuppression, it has been shown that a premature termination, say weaning of steroids, which it's very questionable use and it's only in select cases, has been linked with recurrent pericarditis. So I think overall, reducing inflammation in the acute setting and in the recurrent phases as well is shown to reduce the risk of recurrence.

Dr. Sadeer Al-Kindi (25:53):

One thing that has been suggested is also to restrict activity in the acute phase. And that unknown, really there's no randomized trials in this area, but I think part of it is really masking in unmasking of the chest pain episodes, moreso than actual reduction of inflammation. And obviously you cannot restrict activity for months and months when patients have recurrent episodes for a long time. I think that's something that needs to have shared decision making with the patient.

Dr. Christine Jellis (26:25):

When you say restrict activity, do you specify what type of activity that is? Thinking along the lines of limiting moderate to high intensity activity, letting them do gentle walking and things like that? I know it's always difficult to define for what one patient's level of activity is versus another. But I think reducing exercise, especially in that inflammatory phase is important. And I think all too often, it's something that is not included in the conversation with the patient.

Dr. Sadeer Al-Kindi (26:58):

Yeah. I think restricting high intensity is probably reasonable. I think it's of questionable benefit if you don't have involvement of the myocardial. So if you don't have comments in myocarditis, I don't see restricting low level and moderate level exercise how that can reduce inflammation. There are studies in non-pericarditis models that show that physical exercise can actually lead to improved inflammation, even acutely. I think the jury is out on this and obviously there's not much. It's mostly anecdotal and experience based literature, but I think it's probably reasonable to eliminate high level of intensity in the hope that you're not stretching the pericardium too much and reducing the inflammation from that end. But I think in a mild to moderate intensity, it has downsides of limiting that, especially in prolonged episodes of pericarditis.

Dr. Christine Jellis (27:55):

Dr. Simpson, what do you say to the patient when they ask you "Doc, am I at risk of developing this acute pericarditis again?"

Dr. Tim Simpson (28:03):

Yeah, it's an important conversation to have, because we know that these folks are at risk of having recurrent pericarditis. And it could be seen as up to 25% of cases after their acute presentation. And so I think it is an important conversation to have. I agree completely with Dr. Al-Kindi that incomplete treatment of the initial presenting episode is one of the largest risk factors. And so I think being aggressive upfront with pharmacotherapy and completely treating an episode is critically important.

Dr. Tim Simpson (28:31):

It's a nuanced conversation, because when we talk about limiting people's exercise, for instance, there can be a sense of angst or anxiety associated with this. And then sometimes they do recur and it becomes a conversation of this is difficult and that this wasn't something that they brought upon themselves, for instance. And so you do need to be cognizant and vigilant for recurrences. And then also monitor for the kind of chronic sequelae of an acute paracardial event.

Dr. Christine Jellis (28:58):

Absolutely. And I think there's always so much information that we have to give patients to providing some written instruction around exercise and frequency of medication and everything is always something that we find helpful certainly in our center to make sure that once the patient goes home, it

hasn't been all too much to take in and they can refer back to that throughout their time course. So lastly, thinking about these patients moving forward and your thoughts on ongoing surveillance, starting with you, Dr. Al-Kindi. Are these patients that you bring back routinely or give them a followup plan to follow with their local primary care providers?

Dr. Sadeer Al-Kindi (29:38):

Yeah, I think my practice has been for patients who present with acute pericarditis, we usually follow them up in cardiology clinic. And if they had effusion in the first episode, no matter how much the size was, I typically do a followup echocardiography in those patients and limited typically, just to evaluate, because you can actually miss a worsening of pericardial effusion, which could be a sign of pericarditis that may be clinically silent, but also could be a sign of something else that's going on that may have precipitated the initial acute pericarditis episode, which could be malignancy or something else that was missed during the first episode. So, I typically do a one time echocardiography at followup for patients who presented with pericardial effusion in the first phase. And routinely I don't repeat that beyond if I don't see any change in the amount of pericardial fluid, other than usual clinical assessment and electrocardiography, I don't do any additional testing.

Dr. Sadeer Al-Kindi (30:39):

In patients who have recurrent pericarditis I do, especially if they've had it for more than one year. I do end up doing a CAT scan. It may be an overkill, but I think there is an opportunity to diagnose constriction early on before it goes on to cause true physiologic constriction. And I think in cases where there have been more than two or three episodes in one year of recurrent pericarditis, I discuss with the patients the potential benefit of identifying constriction and pericardial thickening, and so on and so forth that could result in changes. We do use quite a bit of CMR in the acute phase here which is helpful to really define the inflammation in the pericardium and rule out any myocardial involvement as well with myocarditis. But I think for the surveillance, I think it's also, there's not much data to really guide who are the patients that may benefit from surveillance down the road.

Dr. Tim Simpson (31:34):

I think our approach is similar in that following the patients through really the acute phase is critical. I think [inaudible 00:31:41] portion of their cardiology care. And as we know, appropriate therapy can prevent a lot of the long term sequelae down the road. And so I think that's a critical window to keep a close eye on these folks. And then similarly, kind of a symptom guided approach thereafter. We rely heavily on cardiac MR and if there is any hint of recurrence. Then I think the last bit is giving these folks to a center of excellence if they are having several bouts of recurrences or having chronic symptoms.

Dr. Christine Jellis (32:05):

Fantastic. Thank you. So thank you both for participating in this podcast with me today. We had a really nice, thorough, in-depth discussion about the presentation and complications of acute pericarditis. This podcast series on recurrent pericarditis is supported by an educational grant from Kiniksa Pharmaceuticals. And in closing, I like to advocate for all patients and providers to engage in shared decision making for all aspects of pericarditis care. For more educational material, please visit the ahalearn.heart.org website. And thank you for joining me today. And thank you to those who listen, and we hope you'll tune in for the next pericarditis podcast, which will be coming to you shortly. Thank you.