

Coronary Angioplasty Stent Placement  
Shawnee Mission Heart & Vascular Center,  
Shawnee Mission, Kansas  
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Welcome to this OR-Live westbound cast presentation, live from Shawnee Mission Medical Center in Merriam, Kansas. During the program it's easy for you to make referrals, make appointments, or request more information. Just click on the buttons on your screen and open the door to informed medical care. "OR-Live," the vision of improving health.

Hello and welcome. We're coming to you live from the state-of-the-art Cardiac Catheterization Laboratory at Shawnee Mission Medical Center in Merriam, Kansas. Today is the second of a two-part series featuring cardiovascular procedures and cardiovascular disease, in honor of American Heart Month.

I'm Dr. Jay Jackson. I'm a board certified cardiologist and staff member at the Shawnee Mission Medical Center. I will be your host for today's program. Joining me at the patient's side is my colleague and friend of many years, Dr. Jhalan Mukhari.

Dr. Mukhari is also a board certified cardiologist, as well as a certified interventional specialist who will be performing today's procedure. He too is a staff member of Shawnee Mission's Medical Center's Heart and Vascular Center.

The topic of today's program is coronary angioplasty. Over the course of the next hour you will learn about coronary artery disease, how blockage is performed, how we treat them, hopefully prevent them, and the different techniques we use to open up blockages and improve coronary blood flow. You'll have the opportunity to witness live a cardiac catheterization with possible intervention during this procedure.

During this webcast you'll have the opportunity to ask questions. All you need to do is click the "Ask a question" button on your website screen, and we'll answer any and all questions as we can. I'd like to remind you that there will be a rebroadcast of 6:30 p.m. Central Standard time today, and you'll have an opportunity to e-mail your questions then.

Now let me turn it over to Dr. Mukhari to introduce the staff with him. Dr. Mukhari, can you tell us who you have with you today.

Thank you, Jay, and welcome. We have our patient, who has very graciously and kindly consented to participate in today's proceedings. And let me give you a few brief clinical pieces of information. He's an 80-year-old gentleman who has been having ongoing chest discomfort for the past several weeks, and perhaps the past year, at a somewhat who lower level of frequency.

He came into the hospital when his symptoms got worse. He had a nuclear stress test, which was abnormal, and he is has now come here to the Cath Lab to undergo a cardiac catheterization procedure, which is going to determine whether or not we are dealing with any blockages in the blood vessels of the heart.

In the Cardio Catheterization Laboratory with me today is Jackie, who is going to be helping me. On my right, Lorelei, who is the nurse, and she will be monitoring the patient and taking care of the intravenous medications and any other medicines that need to be administered in monitoring his vital signs. And

Stephanie, in the back, in the control rooming doing she is doing in the dark. And with that, I'll turn it back over to you, Jay.

Very good. Thank you, Jhalan. We have a patient who has graciously consented to having this procedure done. As Dr. Mute pointed out, he's been having symptoms. And I'd like to find out right now, I see you've already gained access to the femoral artery, Dr. Mukhari.

Yes.

What have you managed to do so far?

Well, let me just show you what we have done. We have accessed the femoral artery, which is the big blood vessel in the leg, through which we are going to be performing this procedure. We have taken an image of the main pumping chamber of the heart. And I don't know if you can see it on the monitor at your end, but what we see here is that the main pumping chamber of the left ventricle seems to be performing its function quite adequately.

There are no indications that there has been any damage to the heart muscle. There is also no indications that there is any leakage of one of the valves, which is one of the main valves on the left side of the heart called the "mitral valve." So that's the information what we have.

And now we'll be threading our catheter up, which will begin the procedure of the coronary angiography, actually selectively engaging the blood vessels in the heart and taking pictures of those vessels.

Thank you, Dr. Mukhari. While Dr. Mukhari is getting ready to do this procedure, as you can see, he's already taken a picture of the pumping chamber of the heart. It's very strong vigorous contractility. We don't see any wall motion abnormalities, so that's an encouraging sign. It suggests that there's no damage to the heart muscle. We don't know yet if he has any coronary blockages, and that's why this procedure is going to be performed.

As Dr. Mukhari said, he's had symptoms of angina. He had an abnormal nuclear stress test, which is a study performed with chemical induction of stress rather than walking on the treadmill, and it showed a lateral defect of the lateral wall of the heart. This could involve any one of the three major arteries.

What you will be seeing here shortly is a coronary angiogram of the left coronary tree, and that generally consists of two major arteries with a lot of branch vessels. As you can see on the screen now, some initial injections. So this is the first view.

Sir, turn your head over this way. Look to your right.

During the course of this procedure, what you'll see is the camera moves, and Dr. Mukhari will take a variety of different angled shots to look at all the vessels. We have the artery coming down the front wall called the "left anterior descending coronary artery," and it's branch is the diagonal branches.

We'll look at the left main coronary artery, which is the most critical area. And I can tell you now just having looked at the initial shots, the left main is clean and I see no elements of any blockages there. And then there's the circumflex coronary artery, which is so called because it circles around the lateral wall of the heart. That's often a difficult area to see on stress testing and such, and so we'll be able to look it at directly.

Once he's completed looking at the left system, then he will exchange catheters and he will go to the right coronary art which, which goes along the back wall of the heart and part of the lateral wall of the heart and see if there is any blockages there.

So what you're witnessing right now is a heart catheterization. We don't know yet if there will be any intervention necessary. But I can tell you right now, looking at these images, the left side looks perfect, so that's good news.

This gentlemen presented with chest pain, which we -- not all chest pain is cardiac. There's a variety of different causes of chest pain. Obviously, as cardiologists our concern is coronary artery disease or blockages that are formed that reduce blood flow. Coronary artery disease by-and-large is defined as a greater than 70 percent narrowing of that artery, which reduces blood flow. You may have adequate blood flow at rest, but with stress you may not.

When you have decreased blood flow, there is a variety of symptoms one may get. And you can see -- let me go to the next slide. Symptoms of coronary artery disease can run the gamut. You can have severe chest pain, and often we talk about that, and unfortunately it's probably a poor choice of terms to describe coronary discomfort as pain.

Most patients will tell you it's not so much pain as pressure or tightness or squeezing or a sense of oppression. Often they will have shortness of air or shortness of breath while they're having decreased blood flow. The discomforts may radiate. They may go to the neck, the jaw, and often throughout the jaw, the back, down the arms. I've even seen people with nothing other than wrist pain.

In the throes of a heart attack, when you have a total occlusion of an artery, the pain is more intense and people usually do describe that as pain, and often they have nausea, vomiting, and are extremely ill during that. But without damage, without a complete occlusion to an artery, the discomfort is usually less.

This is American Heart Month, and we're particularly focusing on women's heart disease. And I think it's very, very important that the audience understand and recognize that women may have what we call "atypical symptoms." They may have no symptoms at all. They may have some shortness of breath. They may have some tightness or pressure. It may be completely different. So it's extremely important that women not be ignored, because women have heart disease to the same extent as men, and it's important not to just ignore any kind of symptoms.

Diabetics, in particular, are a subclass of patients who may have different symptoms. They may have no symptoms at all or may be misrecognized. And far too often we see people come in with symptoms of what they think is indigestion, they think it's GI, and unfortunately it can turn out to be cardiac, and sometimes these people come in the throes of a heart attack.

The American heart association suggests that probably half of all patients die before they present to the hospital. So their first knowledge that they have heart disease is in the midst of a major heart attack. So fortunately, we get half of the people coming here. We want to get far more people in, because we have a saying in cardiology where time is muscle, and the quicker you can get an artery opened up and these blockages improved, the more heart muscle is saved.

Dr. Mukhari, what are we doing right now?

Jay, we had taken a look at the blood vessel on the left side, and as you pointed out to the audience, we did not find any evidence of any flow-limiting blockages in the blood vessels that emanate from the left coronary system.

And now we have threaded a catheter over to the blood vessel on the right side and engaged the right coronary ostium, and we are in the process of taking our first images of the right coronary artery.

Take in a breath, sir, and hold your breath. And the first picture seems to indicate that there is a little bit of plaque buildup in the distal segment of that right coronary artery, but it does not look as though that is going to be a problem. What do you think? Take in a breath. Breathe normal.

We've taken two images here, Jay, and now we'll doing a --

Take another angle to look at that.

Take another angle, so we'll look at that area we talked about to make sure that that's -- Lorelei, can you turn his head over to the left, please.

What Dr. Mukhari is pointing out is the right coronary artery, which is the vessel that goes along the back wall, and this is a very large vessel in this gentleman. It goes way along the lateral wall of the heart. And maybe he can point out a little later that there are some irregularities out there, but apparently doesn't seem to be flow limiting and doesn't seem to be something that would be causing this gentleman's symptoms, which would certainly be good news for our patient.

Take in a deep breath, sir, and hold it.

Jay, it's certainly a very large vessel. It's what we call a "dominant right coronary artery," giving rise to multiple branches downstream, and there is an area right about here, which shows an irregularity. There's some plaquing out here and some plaquing in that segment which is torturous. But right about here there is a little plaque buildup. There is, indeed, irregularity in that lumen vessel, and then there is some plaquing out here as well.

But, again, the vessel is wide open. I don't see any reason for concern in terms of the blood flow to the heart muscle, and I don't think this gentleman will require any intervention today, which is excellent news for him.

That is wonderful news for the patient. Dr. Mukhari, I was noticing on the initial ventricular gram, the aorta, the aorta group appeared to be a little bit generous. Did it appear large to you looking at it, or is does it appear to be relatively normal?

I thought it was fairly normal.

Okay. The one thing when we do these procedures is we want to make certain that we're not missing something else, so the heart function is normal, good contractility of the pump, arteries really look pretty clean with the exception of that downstream area in the right coronary that shows some minor plaquing.

You want to make certain other things are looked at, and there's tests that we can do to evaluate the source of his chest pain. There is certainly a number of causes of chest pain other than cardiac, but the most serious potentially is coronary artery disease. Coronary artery disease is a process that we used to think took years and years to develop. It's a buildup of cholesterol plaque within the arterial wall that occludes the lumen, as Dr. Mukhari called it, or the opening of the vessel.

The problem is we used to think that, and as we discussed, 70 percent or greater lesions are the ones that reduce blood flow and cause symptoms. They cause chest pain, pressure, or tightness. But you can have a lesser plaque, 30 percent, 40 percent, which does not reduce blood flow, which we may or may not see on an angiogram such as this and certainly would not see it on a stress test.

But those are not necessarily benign lesions. Those are lesions that we found that may ulcerate, rupture, and cause a clot to form, which is a source of heart attacks. So while a significant number of heart attacks occur with hemodynamically, or flow-limiting lesions, there is a certain percentage of heart attacks that can occur with lesser plaque, again, 10, 20, 30 percent. So it's really important that we do everything that we can to prevent those plaques from progressing and to stabilize the plaque.

I'd like to show you a slide here about treatment for what we call "significant coronary artery disease," but I want to point out that we also want to focus on treatment of non-flow limiting disease. First and foremost is medical therapy. Med management is extremely important, it maybe the simplest thing we can do, but often the most overlooked.

So there are certain risk factors that we have for coronary artery disease. Probably first and foremost is the thing we can't change and modify, and that's family history. There's not much we can do right now about our genetic heritage. Secondly is smoking. Smoking is a huge risk factor in the development of heart disease, as well as problems with the lungs. But there is clearly a huge body of data that shows that tobacco use is associated with accelerated hardening of the arteries.

Diabetes Mellitus is a very serious cause of particularly premature atherosclerosis particularly in younger patients. Then things such as hypertension, obesity, and certainly what we call "hyperlipidemia" or "dyslipidemia," or commonly, high cholesterol, and we look at the fractions with the good cholesterol being the HDL cholesterol. If that's low, even if your total cholesterol is normal or less than 200, and even if the bad cholesterol is in a good range, the LDL, if it's less than a hundred, but if you have a very low HDL cholesterol, that is a risk factor we all know of coronary disease. We see that more commonly in males. High bad cholesterol, the LDL cholesterol, in excess certainly of 100, 130, should be treated.

Depending on the range, and you can talk with your family physician or your cardiologist, when this needs to be treated the dietary measures are first and foremost.

Jay.

Yes.

Can I interject?

You certainly can.

I just want to show the audience what we have, we have completed the procedure now. We are going to try and see if we can close the opening that we made in the blood vessel in the in the right groin area, and we're going to try and use a little plug to do that and see if we can afford the gentleman some comfort in being able to get out of bed quicker than he otherwise would be able to do.

Sir, take in a little breath and let it out and breathe normal. You're going to feel a lot of pressure. We have a little plug that we'll try and interpose at the opening of the blood vessel. It's a collagen plug, and that will help seal the opening. We're just trying to position the plug in place so that we know it's going to do its job.

And while we're doing this, you raised a very pertinent question about other reasons to explain his chest pain and raised concern about the possibility that the aorta might be implicated in causing the discomfort that he was having. And I just wanted to let the audience know that we had, in fact, obtained a Cat scan of the chest prior to the heart catheterization procedure, and it showed no evidence of any blood clot in the blood vessels that supplied the lungs, which can sometimes cause chest pain and shortness of breath and also gives us a good look at the aorta as it comes off the heart and courses through the chest down into the belly. So there was no abnormality in that area either.

That's great news for our gentleman. We've ruled out probably the more serious chest pain. Would you agree with that Dr. Mukhari?

I think so. I think so. I think the main vascular and the life threatening, immediate life threatening causes of chest pain I think have been excluded, and I think we can potentially proceed with investigations of other causes of chest discomfort in this gentlemen, which might take some time but are not going to be quite as urgent in their clinical ramifications.

What would probably the next step that you would recommend at this point?

You know, at this point what I would suggest in terms of probability is to look at the GI tract and then see if there is any acid reflux, which is a very common cause of symptoms of chest discomfort, which can easily masquerade as angina or pain coming from the heart, and then there are other issues as well. It

could be a pinched nerve. It could be musculoskeletal pain in the chest, and all those things should be investigated in due course.

Very good. I think the other point to make is that there is no test, unfortunately, that's perfect for diagnosis, and one of the tests that was done was a nuclear stress image study. And that study, as I mentioned earlier, suggested that there was a defect or decreased blood flow on the lateral wall of the heart. As I also mentioned, that is an area that is often silent and very difficult to see. So this is one of those examples, and it's probably less than 10 percent of the time where you have a false positive stress test. So in other words, the test was abnormal but there is no significant reduction of blood flow, and that's very good news in this gentlemen.

There are also a percentage of tests that are false -- you know, this is a false positive -- I'm sorry -- a false positive stress test. There are false negative stress tests as well. So you may have a stress test that looks perfectly normal with no defect, no decreased blood flow, but, in fact, the patient may have severe disease or multi-vessel disease.

There's a thing we call "balanced ischemia." Ischemia meaning lack of blood flow, and sometimes those tests will underestimate the extent and severity of coronary artery disease. So on either side we can have false positive and false negative studies.

The next step, as Dr. Mukhari says, will probably be a GI evaluation. We'll get our gastroenterology colleagues involved. They may want to take a look at his esophagus or stomach. So there's other causes of chest discomfort. But there's no way, short of knowing, except for doing these tests.

At this point, I would like to mention if you have any questions, please feel free to ask. Just click your "Ask a question" button and send them in. I think I've just been handed a question. This is an excellent question. It says, "What is the difference between cardiac catheterization and angioplasty?"

Well cardiac catheterization is the diagnostic study, and that's the tool we use that Dr. Mukhari just performed. What you have seen is a cardiac catheterization with coronary angiography. So in other words, we took a look. He implanted a catheter at the opening of the arteries, injected dye, so we could outline the arteries and look at see if there are any blockages.

An angioplasty is different. An angioplasty requires a diagnostic portion where you inject the dye, but at that point, once you see a significant obstruction and you have deemed it significant enough to improve, to open up, then we have a variety of techniques.

And if you look at this next slide, we've talked about medical therapy, and then under "Percutaneous coronary intervention," that is the variety of angioplasty techniques that we have.

There is stent angioplasty, percutaneous luminal angioplasty, and that is probably the most common technique we use currently, where we snake a small little guide wire down the coronary artery, and then we pass a balloon catheter and use that balloon, that's the coronary angioplasty, use that balloon to open up the vessel. That paves the path so we can pass the metal stent. And then we take a stent and put it in, and it's on a balloon, and then we open up that balloon, and it expands that metal stent, which is generally stainless steel in compound, and it opens it up, and we take it and stretch it so the stent gets fitted right in that size. We size it, so we know it's the right size of the vessel.

Sometimes we can do that just by eyeball estimation. Other times we use other techniques such as intravascular ultrasound, where we take the same guide wire and pass a little tiny ultrasound catheter down where we can actually look at the plaque itself. We can measure it. Measure how severe it is, and also measure the size of the artery. Most of the time that's not necessary, but sometimes it is; plus, to look and see how much calcium.

If you have a plaque that has a significant amount of calcium in it, that may be more difficult to open up, and that leads to more techniques that we'll discuss.

One of the questions that is frequently asked, and I anticipate this, is what is the difference between bare metal stents, the non-medicated stents that we put in, versus medicated or what's known as drug-eluting stents. And there has been a lot of flurry of information in the press over the course of the past year, year and a half. And I have had a lot of patients come to me and say, "Well, you know, Doc, I don't want one of those medicated stents. I hear they're bad."

The data that has come out since then has showed us that that's not the case. Both bare metal stents and medicated stents, or drug-eluting stents, have their role, and we often decide at the time what kind of stent we'll use. If you have a very large diameter artery and a very short local lesion, you can often get by with putting in a bare metal stent. The whole theory behind that is you have a lesser chance of that re-stenosing or re-narrowing inside that stent.

What happens in a stent when they close down is really not a growth of new cholesterol plaque, which we've spread against the wall, but what happens is scar tissue forms, so it's literally scarring in there. That occurs in anywhere from 20 up to 40 percent of lesions. That's why Medicated stents were developed, and they contain a medication that's secreted from the metal stent and prevents scar tissue from forming.

So at one time it was thought that the medicated stents had a lot of problems with -- thank you -- had a lot of problems with clotting, and that is true. There is a concern over any stent clotting off acutely or later, so at the time of the procedure, if Dr. Mukhari would have had to place a stent today, we would have had the gentleman on IV blood thinners such as heparin or low-molecular weight heparin, or what we typically use is a drug called "Vipalorudin." It prevents clots from forming, and we give anti-platelet drugs. We give aspirin or either before the procedure or immediately after the procedure, we will give a loading dose of Plavix or Clopidogrel, and that you've probably seen adds about that. That's a medication that is a very potent anti-platelet drug, and it prevents these stents from clotting off.

The real issue between a bare metal stent and a drug-eluting stent is that for a bare metal stent, you don't need to use Plavix long-term. Probably three to six months is adequate. For a drug-eluting stent, Plavix use is long-term. And when I say "long-term," that has changed as a moving target. But at one point it was a year. Now it may be three years. And by and large, I think we're recommended that most patients that have a drug-eluting stent should be on Plavix or a similar type of anti-platelet drug lifelong.

One of the questions was, "When do we decide that a heart artery needs to be fixed?" Well, again, it's when we deem that significant. So if a patient is having symptoms of angina, if they have chest pain, that's one indicator. If they have an abnormal nuclear stress test, that's another indicator.

We also have another technique that I don't think I have on this slide, but another technique called "fractional flow reserve, where we pass a little wire down that measures the pressure, and then we give a medication to see if there's really reduction of blood flow across there. That's a very sensitive technique that we do right here in the Cath Lab to see if a blockage is significant.

So if in this gentlemen, Dr. Mukhari had seen a plaque in that right coronary artery that was borderline, he may have passed a fractional flow wire down and measured that to see if it was significant. It's pretty clear just by looking at the films that that's not necessary.

The question about when do you decide what kind of stent to use. Again, I was getting to the point where if it's a big artery, a bare metal stent will work, a smaller artery or in some of the multi-vessel disease or multiple vessel blockages, or a diabetic, we think that the drug-eluting stents are probably better. So we have a variety of stents here on the slide that we have mentioned.

There's also other techniques that are used less often called "atherectomy." It's another percutaneous approach, and percutaneous just means we go through the skin. There was an old technique called "directional coronary atherectomy" where we would literally shave out large sections of plaque. That's not used much, if at all, anymore, because there has been a fairly high rate of re-narrowing of these vessels.

Same with rotational coronary atherectomy. That's a technique that's useful, particularly in a long lesion or vessel that has heavy calcification, and it's a what a lot of people call the roto-rooter procedure. We use a diamond encrusted burr, you drill out the calcium, and then you may go ahead and put stents in after that.

On occasion, if somebody comes in with an acute heart attack, they have clot in the vessel, we'll literally take a suction catheter, very tiny catheter, and go out and suction out the clot, and that helps open up the vessel.

I think we've been handed some more questions. Let's see here. Dr. Mukhari, there's a question that I'll turn to you. It says, "What significant changes in angioplasty procedures have occurred in the past few years?"

Well, Jay, I think one can safely say that the equipment that we use from the early days has undergone a sea change. The catheters that we use to gain access into the vessels are smaller. They're more user-friendly. The balloons and wires that we use to open the blockages up, they have become much more versatile in being able to do the job that they were supposed to do. And then, of course, the stents.

I think you've gone through a fairly comprehensive list of equipment that we have used historically in dealing with blockages in an attempts to try and open them and keep them open over the long term.

And I think one has to say that stents are probably the most significant improvement that has impacted the procedure in the Cardiac Catheterization laboratory. And, you know, there are various kinds of stents, obviously, and the stent design has improved from the early days when they were very difficult to deploy and very difficult to get to the target lesion. Now with the stents being as flexible as they are, we can pretty much get to anywhere we want.

The issue of the bare metal stent versus the drug-coated stents is an ongoing debate. And I think it all comes down to this issue of lunch. There is no free lunch, is there. One can put in bare metal stents and deal with the aspect of the stent restenosing over a period of time, and then we can treat that and cure that with putting in a bunch of drug-coated stents, and it looks very pretty when we're done, but when we're dealing with this whole issue of having to keep our patients on a potentially hazardous drug for the rest of their lives.

I think in our practice, we're dealing with a progressively older population of individuals who need these procedures done. And once we commit people to a life-long therapy with very potent blood thinners, that is Plavix or assorted medications of the like, and then six months down the road they need a gallbladder taken out or they break their hip, they need that fixed, or they need another surgical procedures, then we're in a bit of a dilemma, and we have to take them off the drugs because surgeons are not going to be willing reluctant to be go ahead and take patients into surgery and operate on them with blood thinning medicines onboard. And one has to deal with the prospect of the stent closing off while they're being taken off these medications, these protective medications.

So all this needs to be taken in context of what we end up doing and what choices we end make in the Cardiac Catheterization Laboratory. And as you and I have discussed various times, I think one needs to take a very holistic approach to individuals and how we treat them, keeping in mind not only the results in the Cardiac Catheterization Laboratory but what our choices are down the road, what the patient desires, what we would like the patient to do over the next five, ten years, and those things need to make an impact on what decisions we make while we are pulling out a stent or a balloon or making a choice as to whether or not they need to be stented at all.

Well I think that's a very god point, Dr. Mukhari. I mean not everyone -- and the questions says not everyone is suitable for stenting. "What reason or reasons would be given for not going ahead with stenting?" And I think that may lead to some of the questions. We don't want to leave our cardiovascular surgeons because, certainly, there is a role in this day and age area for coronary bypass surgery.

So what reasons would you have for not going ahead with stenting, other than the fact that the lesion isn't significant? So in other words, if it ain't broke, don't fix it. What other reasons would you use for not proceeding with stenting, Dr. Mukhari?

Well, there was a very telling study, a very important study that came out within the last year. You know, Jay, as time goes on, I lose track of time, but I think it was within the last year, wouldn't you say, the College Trial came out?

Yeah.

And that study was an important study. And what it tells us is that those of us who have practiced the medicine or practiced cardiology from the standpoint of patient-centric view is I think it validates that position. And what it says is that if you have angina and it is tolerable to the patient and tolerable within the constraints of what the patient desires to do, and it is treatable with medications, then that is a very reasonable way to proceed, so long as we are aggressive with medical therapy.

Now if the individual has got what we call "unstable symptoms" or there is a huge burden of heart muscle that is not getting enough blood supply, then that becomes a different issue. And one would say, I think, categorically that anybody with unstable angina or what we call "unstable angina equivalence" such as non-cue wave heart attacks and myocardial infarctions, I think they need to be intervened upon. There is no question about that. People who have having an acute heart attack there is absolutely no question they need to be taken to the Cath Lab and fixed as soon as possible. You mentioned that time is muscle, and that is extremely and very, very true.

Beyond that, people who have stable an angina pectoris, I think, again, we need to come back to the patient. We need to come back to how old the patient is, what the other comorbidities are, what the patient wishes of life. I mean how much is the patient wanting to do? Is it a matter of keeping the patient comfortable walking from the bathroom to the rocking chair and back, or are we talking about octogenarian maintainer? I think the decisions are going to be different.

And I think that at some point in time, before making an arbitrary decision to go ahead and do stenting on somebody who has got multiple blockages, particularly if they are diabetics, I think it is very reasonable to stop and get a consensus opinion from our surgical colleagues and have a discussion with the family and the patient, and arrive at a decision, which everybody is comfortable with and which will likely give the patient the best long-term durable results in terms of revascularization. And the choices now days are many, and I think we are very fortunate. But we ought not lose sight of the fact that we have choices.

Very good. Thank you very much. I wanted to remind everyone that we will be answering questions at the rebroadcast at 6:30 to 7:30 p.m. Central Standard Time today, so hopefully we can get back to you, if not live, by e-mail with some of these questions that are coming through. We really appreciate the questions.

Here is one that came in from Art. He said, "Two weeks ago I had a drug-eluting stent implanted in the circumflex coronary artery for 95-percent occlusion. They implanted a Taxus Liberte stent, which is a drug-eluting stent. What are the limitations on activity or exercise after this procedure during the first few weeks or months. And I would have to say that those questions really have to be left to the performing cardiologist.

Part of the problems are not so much what's done if you had an excellent result, to which I suspect you did. Some of the questions revolve around the groin site. As you can see today, Dr. Mukhari used a closure device. Sometimes there's local pain and discomfort. Sometimes there can be a little blood seeping around that area. So your doctor may have some specific recommendations regarding not squatting, lifting, certainly walking and those sort of things that are within your comfort range should be done.

I had one patient, a friend of mine, who is actually a physician, who we did this procedure and used a closure device. At about a day or two later, he decided to jump up the stairs two at a time and felt a pop, and it ended up breaking loose. So you don't want to do that. So you want to be very careful.

There was another question that I wanted to get to. It said, "When is the best time of day to take Plavix, 75 milligrams daily?" It probably doesn't matter. It can be taken any time, very important.

Oh, I think in the interest of the patient who has been laying on this table quite some time, you know, we have very good news, we would like to wrap this up. Dr. Mukhari, you want to get out and talk to his family and give them the very good news that his arteries are virtually clean, but this does not mean we won't be suggesting that this gentleman do everything he can to prevent those minor plaques from progressing.

One of the e-mail questions basically said, "How are we going to follow those plaques up," and that is an excellent question. What we typically do is everybody everything we can medically with diet. Often statin therapy, particularly if their cholesterol levels or triglyceride levels are high, we'll talk about drug therapy. Aspirin has been shown to reduce the risk of heart attacks, as well as strokes. Statins have been shown to do the same. It doesn't just lower drug level, but it actually reduces the risk of cardiac events. So we'll want to do everything with this gentleman to prevent that from happening.

In absence of symptoms, we may want to repeat some kind of a stress test in a year, with the knowledge that this last stress test was a false positive one, and we'll keep that in mind. But we'll certainly keep an eye on this gentleman long-term to make certain that he does well.

Oh, I think we'll about out of time, and we'll get this gentleman off the table and get moving. What you have witnessed is a cardiac catheterization. And fortunately for the gentleman, but maybe not for the viewing audience, we didn't get to see an angioplasty or stent deployment, but that is a very common procedure.

I thank you, the audience, very much for watching. I hope you found this informative. I'd like to give an extra special thanks to our patient, without whose gracious consent, this procedure would not have been possible.

What we have seen today is a cardiac catheterization or a diagnostic coronary angiogram. This is performed live from Shawnee, Mission Medical Center's Heart and Vascular Center in Merriam, Kansas.

On behalf of myself, Dr. Jay Jackson, Dr. Jhalan Mukhari, and all the staff and crew here at Shawnee Mission Medical, I'd like to thank you for joining us. Good day.

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