Enhanced External Counterpulsation (EECP) as an Adjunct or Primary Therapy for Heart Disease: A Special Interview With Dr. S. Ramasamy

By Dr. Joseph Mercola

JM: Dr. Joseph Mercola
SR: Dr. S. Ramasamy

JM: Hi, this is Dr. Mercola, helping you take control of your health. Today we are joined by Dr. S. Ramasamy, who, by the sound of his name, hails from India. He’s a cardiologist there and he’s doing some very innovative work. I’ve had the pleasure of meeting him personally at the ACIM annual event in Orlando last year. That’s the Academy of Comprehensive and Integrative Medicine.

I had a chance to attend his talk there. It was really good. I wanted him to share this information with you, because it offers such a valuable and basically ignored resource in the treatment and prevention of one of the most common causes of death in the United States: heart disease. Welcome and thank you for joining us, Dr. Ramasamy.

SR: Thank you, Doctor.

JM: You’ve been doing this for a while. How did you get interested in this? Let’s talk about what the form of therapy is. Why don’t you introduce us to it? Eliminate the surprise and tell them what it is.

SR: Okay. As you asked me, I came to the U.S., I think, in 1998, as a resident. As soon as I came, I started working on a research project with the tests ongoing in U.S. It’s called EECP, Enhanced External Counterpulsation.

We all know about when you have coronary artery disease or cardiac disease, you have multiple options to solve that. You have medical management. After the medical management phase, then you go for an angiogram. Through the angiogram, they are able to find out how many blocks you have in your coronary arteries. Based on the blocks, it’s either you’re going to be a candidate for a bypass surgery or an angioplasty. But what people don’t know is another option called the EECP, Enhanced External Counterpulsation.

JM: Excuse me for a second. There’s also another option of stent, which I think has been proven in some recent multivariate analysis to not be effective at all, alternative to the bypass or the angioplasty. Do you do any of those procedures? Are you an interventional cardiologist?

SR: No, I’m not. I’m in non-invasive cardiology. I’m specialized in heart failure management.

JM: Heart failure management. Okay.
SR: It’s something with various options, I guess. As I currently said, angioplasty, which is peripheral angioplasty, or they may use a stent, which can be a normative stent, called a drug-eluting stent or a biodegradable stent. These are all the types of stents that they are using for patients with angina.

Now, the question is – there is another option for the patient called EECP – what does EECP actually do? EECP, in this current modality of a treatment, is a one-way treatment, which is absolutely a non-invasive way of treating the same cardiac disease without the intervention. At the same time, this treatment is able to significantly increase the blood flow across your blood artery. The heart muscle can get more blood supply without you actually going for these invasive procedures, like bypass surgery and angioplasty.

JM: That is wonderful. It’s my understanding that this procedure is actually an alternative to coronary bypass, because rather than creating a new graft where there are one, two, three, even four vessels that they graft in, you’re getting multiple vessels. Tens, probably hundreds, maybe even thousands of tiny vessels that provide as much, if not more, volume of blood to supply the heart. I’m wondering if you could expand on that, because that seems to be one of the principal benefits of this approach.

SR: Yeah. You’re absolutely right. I think there are millions of collaterals on small vessels, when in fact the main vessel that get the graft or the stent, it only contributes to 30 to 40 percent of the blood supply going to the heart. The vast majority of the 60 percent are actually supplied by these vessels called microvessels. These are in millions.

When we do EECP, actually what is going to happen is we are not going to increase the blood supply only in the area that is requiring the blood supply, but into the entire cardiac muscle. It’s not specific to the ischemic area. It globally increases the blood supply across your heart muscle. This millions of collaterals can actually replace the blood flow where there is a deficiency, because the main vessel is blocked. That’s the great thing about the EECP. It’s non-invasive. It can simply increase the blood flow by using microvessel circulation, purposely much better than the main vessel is able to supply.

JM: Okay. There are many, many other benefits. Hopefully, we’ll have a chance to discuss them today. But what I want you to do now is describe. We’ll seek to put in some pictures and photographs, because it’s difficult to visualize it. But if you can describe mechanically what’s going on, because many people have never heard of EECP.

There are two names for it, as I understand. It’s EECP, as you mentioned, which is sort of a trademark term from Vaso Medical, and the more generic term, which is ECP, which is a wider variety of companies providing the equipment. Why don’t you discuss that?

SR: Yes. I think that EECP is a trademark of one company called Vaso Medical. ECP is actually the concept. But what we’re talking about is actually ECP: the concept of counterpulsation.

You asked me how the EECP is performed. During the treatment, the patients are asked to lie down on a treatment table, which has a voltage system. What they do is they wrap your lower limbs –
your calves, lower thigh and upper thigh region – with some blood pressure-like cuffs. And then you are hooked up to an electrocardiograph (EKG) machine. What actually happens is the machine is going to read your EKG beat by beat, synchronizing your heart rate with the machine.

Exactly during the particular phase of the cardiac cycle called the diastolic phase, what happens is the cuff inflates with the pressure up around the 260 to 300 millimeter mercury pressure. When this amount of pressure is behind the lower limb – so it goes sequentially, the lowermost part, the cuff goes fast and then your upper thigh and the lower thigh and upper thighs.

When this sequentially inflates, it pushes the blood from the leg towards the heart. When I say compress the lower limb, it compresses actually two compartments. One is the venous compartment. Another one is the arterial compartment. When the arterial compartment is compressed, the blood goes in the reverse direction. It is timed in such a way that the main valve, the aortic valve is closed, so the blood can directly route into the pulmonary arteries, which is, I think, in the route of the aorta.

Basically, what it does is it increases almost two to three times the blood supply to your pulmonary artery. Similar to what an anaerobic exercise can do. Basically, your heart must be thinking you’re performing like a 6-kilometer fast running. That much of blood is increasing into your pulmonary circulation. At the same time, as I said, it also compresses the venous system and increase the blood we send to the heart. In fact, it increases the cardiac output.

These two functions are very important. Increasing blood flow to the pulmonary artery is helpful for patients who have ischemia or blockage in the pulmonary artery. It is helpful to patients with heart failure, because it can increase the cardiac output. This procedure is done every day for one hour, done ideally five days or six days a week. It goes up to six to seven weeks tangentially. In some patients, it can be also performed twice a day. The treatment can be cut short and completed in almost two weeks’ time.

**JM:** This instrument, it really is remarkable. Let’s get into some of the technical details now of how someone can avail it themselves. Because there are clinicians, and not necessarily cardiologists, although there is certainly a number of cardiologists in the United States that offer this service. But you can go to websites – we’ll try to put some links in here – where you can sign up for clinicians and have this treatment done.

Now, as I understand in the United States, it is a Medicare-covered and insurance-covered treatment. If you have the diagnosis of angina or coronary heart disease resulting in angina, then it’s covered. If you’re not, it’s still a lot better approach. Because you need about 35 treatments. It’s typically about 5,000 dollars in average. It could be a little more, could be a little less. It’s unusual for it to run out of that range, but that’s typically what the 35 treatments cost. That’s going to provide the results for about five years or so, I would think. Why don’t you expand on that?

**SR:** Yeah. I think when EECP was introduced in the U.S. – I think they got it there early ’92 – I think Medicare got that approved in ’96. When EECP was introduced in the U.S. for no-option patients, in the case if a patient should have coronary artery disease, and there should be decline, they’re not amendable for the standard influential procedures, like bypass surgery and angioplasty.
When these patients are at the end-stage, when they’re not able to perform, when they’re not able to undergo these influential procedures, then they are allowed to undergo EECP as a last-resort procedure. That’s what the indication in the U.S. is. It’s required for angina alone.

But when we took this treatment to India, we have a wide variety of patients who were able to get this treatment. In fact, the insurance companies in India came forward and allowed us to do this treatment, even with patients with heart failure, and also as a primary treatment for patients with angina.

Here in India, the indication is a little bit different. They said that if you have a patient who has coronary artery disease – So, by certain investigational procedures like the treadmill or like an echocardiography, or has a history of a heart attack, they can directly go get an EECP rather than waiting for a bypass surgery or an angioplasty, or come to EECP after the failure of angioplasty and bypass surgery. That’s an expansion of this indication in India that help us to expand this treatment modality much faster than what we have done in the U.S. I think this treatment has a great potential not only for angina, but also for heart failure and also as a primary treatment.

JM: Yeah. I first became aware of this in the mid-‘90s. I was very skeptical because it seemed – Why would you embrace this approach when you could just exercise? I want you to address this. Because in many ways, this is a type of exercise, but it’s an exercise that is absolutely impossible for you to reproduce yourself. You just cannot do it. The physics and biomechanics don’t allow it. Why don’t you help us understand the difference between this and exercise and why my initial impression of this was so seriously mistaken?

SR: It’s a very interesting question. You just said you have to do exercise. “Why would I go to EECP and try to improve my collaterals when exercise has clearly shown that it can also improve the collateral?” Number one, when you treat a cardiac patient, most of the patients are so sick they cannot even walk like three or four minutes without resting. Probably, they have a stable angina or an exertional angina. Even a minor increase in exercise, they significantly get angina pain.

This group of patients, obviously, you cannot push them to do exercise. Even if you push them to do an exercise, they may not be able to achieve more three to four minutes on the walking. Basically, for this group of patients who cannot exercise, EECP is a good option.

I will also add up another thing. I mean if you compare EECP to exercise – That’s a good comparison. But let’s say that somebody, who is not athletic or they have body strain, you put them on a sudden increase in exertion, in the case that you ask them to run maybe like a kilometer or like a mile, what happens really is they’re not trained to do so. Their heart rate increases. Their blood pressure shoots up. Basically, the heart is trying to pump so hard because of the increased pressure and heart rate. Probably the effort of exercise won’t reach them, because they’re going to struggle by increasing their exercise.

But when you do exercise, the opposite happens. It keeps your blood pressure down. In fact, during EECP, because it relaxes your vessels, your systolic pressure goes down. Your heart rates are kept
constant. By keeping your blood pressure down on a constant, you are normally increasing the blood flow to the coronary. You’re getting maximum benefit of more than exercise can do, without actually doing exercise. It’s kind of a passive exercise that we can do for anybody. This is an advantage of EECP in both the cardiac patient and also non-cardiac patient who are not doing regular exercise.

**JM:** But even from the physics and biomechanical perspective, exercise will never cause that pressure to increase during the diastolic or the resting phase of the heart and pump the blood up. It just cannot do that. That’s the magic of EECP, because during that diastole, when you have this return increase, it essentially pushes the blood in and massively increases the number of collateral vessels in the heart. Exercise will do that, but you’ve got to be healthy to do that. It’s still not going to work in that mechanism. It just won’t. It’s a totally different approach to improving collateral circulation.

**SR:** Yes. Of course. Because as you can understand, our body has been adapted in such a way. You have it at systole. Let’s say the normal blood pressure is 120/80. In 120 systole, all the organs get the maximum blood supply. When diastole comes, the blood pressure falls. What happens in an EECP is the opposite. During the systolic phase, because of, like I said, the increased cardiac output, all the organs get a maximum blood supply. Also during the diastolic phase, because of the cuff compression, again, it can increase blood supply. Basically, during the EECP, you’re getting a dual blood supply rather than the single blood supply that accompany the systolic phase.

**JM:** Yes. When you get a series of treatments, which is, typically, as we mentioned, 35 treatments typically over the course of seven weeks – maybe five treatments a week for seven weeks – how long is that treatment good for?

**SR:** Usually, if it’s a cardiac patient, by the time they reach the 15th to 20th session, they simply feel better. Because, I think, by the 15th to 20th session, that is when the collateral circulation starts happening. Also, when you’re doing EECP, because of the sheer stress of increased flow across the entire vascular system, your body responds. All the endothelial cells, which is lining your blood vessels, responds to this because of the sheer stress. Secondly, the line of growth hormones are also very important with the nitric oxide.

We have seen a lot of times that the nitric oxide levels shoots up three to four times the normal value. Because of that, the patient, the cardiac patient, there is a single vasodilation that can happen across the body. That shows the patients’ symptoms drastically comes down when the collateral circulation started taking place. After 20 sessions, another 20 sessions, after 15 sessions, another 20 sessions are given for the maintenance of the cells.

Whenever [inaudible 15:57] the collateral happens, it has to become a permanent value. When you do the treatment for a long period of time, up to 34 sessions, all the new vessels become a permanent part of you. Even if you stop, after you stop the treatment, the benefit has been shown to last for up to five years.

**JM:** I want to make it really clear here that ECP is not, is not, a magic bullet. It’s a very useful modality, a far safer, less expensive and superior treatment to angioplasty or bypass. It’s, again,
not a magic bullet. It’s used in addition to lifestyle changes, so that you can optimize in a cyclical ketogenic diet and optimize your cholesterol ratios and eventually get into an exercise program. That, combined, is a powerful synergistic event. This is not something that should be used by itself.

I mean it would be useful, but a lot of people get bypasses done and they don’t do a darn thing with their diet. Probably the majority of people just continue the same lifestyle. Of course, they don’t address the foundational causes that contribute to the cardiovascular disease. You do a good job with that too. In fact, your wife, who I had the chance to meet in Orlando, is also a big fan of mine. She reads the newsletter all the time. It was interesting to connect with her. You and your family are very familiar with these approaches.

**SR:** Absolutely. Yes. She reads all of your articles. I think she is following your diet.

**JM:** Yeah. She’s really healthy. No question. Why don’t we venture off and not necessarily focus as much on the cardiovascular disease, although it probably is the most important component. It has many other benefits. It’s really useful to view this modality as a form of passive exercise. Like exercise, it has many of the same benefits. When I was listening to your presentation, I didn’t realize it actually decreases insulin resistance and is useful for the treatment of diabetes. Why don’t you expand about that? And then peripheral artery disease, too, not just coronary artery disease.

**SR:** Actually, increased attention is given to EECP as a primary treatment or a preventive care. For example, we have seen patients with the glucose intolerance. These are a group of patients [who] are not considered normal. All their labs are there in between. Their blood sugar level is much more than what it’s supposed to be. When we put them on EECP, it’s actually able to come back to normal. That’s a fantastic finding, because what happens is it significantly reduces both the fasting, as well as the postprandial blood sugar level very much down. Now, the patient are considered normal.

We still don’t know the exact mechanism of how it is able to reduce the insulin resistance and how it is able to remove the diabetic to normal. One of the reasons is it’s a form of an agility exercise. It has the effect of increasing the blood flow to the pancreas. It also increases the glucose utilization on the skeletal muscle. Because when you put the cuff and it inflates and deflate for 35 days, somehow, the receptors in the muscles are stimulated. They are able to absorb this blood sugar levels in the circulation.

These people, their blood sugar level has a [inaudible 19:30]. Also, we are still doing our treatment. As you know, getting the treatment to the cardiac tissue mostly doesn’t happen. We have seen most of these patients who are put on the EECP, they go for hypoglycemia. When we started to look into it and said, “Why did the patients go for hypoglycemia?” We found out, because of EECP, that blood glucose rapidly drops and we are able to stop most of the patients with their anti-diabetes drugs, and we are able to reduce their insulin dosage also. It’s a very good finding.

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Also, like we were discussing, it’s not only effective on blood sugar levels. It is also shown to reduce the bad (LDL) cholesterol and significantly increase the high-density lipoprotein (HDL) levels. And then you have statins. You know that statins can reduce your low-density lipoprotein
LDL levels, but it won’t increase your HDL level. If you want to look into increasing the HDL level in addition to the exercise, you’d want to be taking some fish oil. But I think EECP is a fast treatment modality, which not only decrease your LDL, but significantly increase your HDL levels also.

JM: Yeah. That’s fascinating, absolutely fascinating. As you mentioned earlier, one of your sub specialties is heart failure. It’s obviously very useful for that. Just one of the reasons I’m so passionate about this is that I actually incurred a cardiac injury not as a result of coronary artery disease. My blood vessels and cholesterol ratios have been outstanding for all my adult life. But because of excessive exercise, I developed some dysfunction in my left ventricle. It’s called left ventricular diastolic dysfunction.

As a result of that, I had impaired cardiac function, which is why I actually purchased a used machine, because it’s a lot easier for me to get the treatment that way, rather than go travel maybe up to an hour each way, because I live in a relatively remote community. I don’t live near a large urban area. But most of these machines are in large urban areas. It was easier for me to do it that way. But we’ll seek to put a link in here for clinicians who are watching this and are interested in providing this service to their local community.

Because, really, one of the intentions of this interview is to stimulate and catalyze an interest in this approach, because it’s so desperately needed. We really need a large number of clinicians out there offering this service to people, so that they have an effective alternative. Then they don’t have to go through the surgical option, which is almost invariably disastrous and certainly never addresses the fundamental cause. Why don’t you further expand on the treatment with heart failure?

SR: Yes. I think we had a discussion, Dr. Mercola. I think that diastolic is a very important and interesting aspect. Because most of them would think that if the heart function is regular, then the systolic function goes down. I mean your number, which is supposed to be like 55 to 68, if there is no infarction or dysfunction, below 55 or below 50, let’s say there is a reduction in [inaudible 22:33] function. We all know that.

But the second thing we can break [inaudible 22:38], almost 50 percent is in diastolic dysfunction. We don’t have any medical management or treatment for this diastolic dysfunction, but EECP has shown very good promise in initial studies. We have good experience with diastolic dysfunction. EECP helps with this, because when you inflate and deflate the cuff, the deflation of the cuff significantly dilates your vessels.

What happens is the heart is able to easily pump into the dilated vessel. When they can easily pump the blood into the dilated vessel, the end diastolic pressure comes down. That’s a very important parameter to address your diastolic dysfunction. The thickness of the vesicle, rather than relaxation, becoming very difficult, you can easily dilate it. The diastolic dysfunction has shown to significantly improve with EECP.

Second is heart failure. In the U.S., it’s a big epidemiological disaster. What really happens is you have a lot of medical management for heart failure and [inaudible 23:39]-oriented management.
They are able to improve the quality of life and decrease the mortality. But one they couldn’t achieve is repeat rehospitalizations.

Once a patient gets admitted for heart failure, then the chances of them getting repeat hospitalization in 30 days or 60 days is almost 30 to 50 percent. It’s a huge number for rehospitalization rates. We have shown that if you put them on EECP immediately after they come back, after they got hospitalized, the rehospitalization rate has dropped from 30 to 40 percent to 15 percent.

EECP is a very good treatment for heart failure, because it increases circulation to the myocardia. Because it increases the blood supply to the myocardia, the muscle contracts much better than before. It improves your LV function, which is the ejection fraction. It improves your quality of life. It is also able to reduce your rehospitalization rates, and also improve your survival. The impact of EECP in heart failure is very [inaudible 24:45] that we have almost completed 2,000 patients of heart failure in India. I think two will come out in papers to show that it has a significant effect on patients with heart failure.

**JM:** That’s great. Now, one of the side effects of heart failure physically is that it actually causes the left ventricle to enlarge, left ventricular hypertrophy. I’m wondering in your observations and treatments of people if that enlargement or the hypertrophy reduces with the treatment.

**SR:** Yes. The one important thing in heart failure is, as you said, the enlargement of the blood vesicles many times. Initially, when EECP was introduced in the U.S., heart failure was a contraindication for EECP. The reason is when you push the blood back into the heart, if the heart is so weak that it is not able to pump the blood outside the ventricle, then what will happen is, if there was a back pressure, the blood will go to the pulmonary artery. When the pulmonary blood pressure increases, it actually causes pulmonary edema, which was very common.

Almost 5,000 to 6,000 of these people who underwent EECP actually ended up with pulmonary edema. But now with the recent knowledge about this hemodynamic stem cell – there’s a lot of paper coming out – I think that we’ve got to put the manual on that. We have them on the specific [inaudible 26:06] to treat the heart failure patient with the inflation and deflation timing. If they are able to understand the inflation and deflation timing clearly and they are able to apply this to the patient, they would have significant improvement in cardiac output, without worsening or without putting the patient on pulmonary edema.

**JM:** That’s great. But does the enlargement of the left ventricle decrease?

**SR:** Yes. I think one of the important that which predict the outcome of heart failure is your end-diastolic volume. If your end diastolic volume and the left ventricle is dilated, then your [rate] of mortality or repeat hospitalization is very high.

We have shown, which is also published, if you do 35 days of EECP treatment, actually the end diastolic volume is significantly reduced. It shows that the dilated heart is able to shrink a little bit less. It can have a little bit of shrinkage. The compression power increases and your repeat hospitalization and mortality rate will be normal.
JM: Yes. High blood pressure, which we didn’t mention before, is another common disease, which contributes to coronary artery disease and other cardiovascular diseases. It’s more of a primary disease. It doesn’t have symptoms, of course, other than the elevated blood pressure reading, which most people are monitoring regularly. How does this work for high blood pressure?

SR: Yes. As you know, most of the patients with cardiac disease also have hypertension. When we’re doing EECP, most of them are on medical management for the hypertension. But sometimes, that’s still how they control blood pressure. They have like 160/150 or 180/90. When they are on EECP, every time, when they complete one hour of the session, when you measure the blood pressure before the treatment and after one hour of the treatment, there will be a drop in blood pressure of about 16 to 10 millimeters mercury pressure. This is significant.

If you keep on looking at this for a long period of time, and then there are some trials that came up that show that if you do EECP for 34 days with a patient with borderline or a hypertensive patient, there is a drop in systolic blood pressure after the completion of this treatment.

The reason for this drop in blood pressure is a simple logic. If you keep inflating and deflating the cuff in the lower limb, and actually your lower limb constitutes to 60 percent of your peripheral vascular nervous system, which causes increased blood pressure.

If you inflate and deflate in a cyclic manner for almost 24 days, what will happen is, because of the increased nitric oxide secretion from the endothelial cells, your blood vessels tend to dilate. Once your blood vessels dilate, it is absorbed in the peripheral vascular system when the systolic pressure comes down. This has been shown in many trials. EECP has a very good effect on patients with hypertension.

I have already talked about the cholesterol and [inaudible 29:01]. As a preventive tool, if you have any treatment modality, which can affect your cholesterol level, your blood sugar level and your pressure level, I think it could have a great potential in prevention.

JM: Yeah. It’s just a magnificent tool with virtually no side effects, except for the cost and inconvenience. But it’s not going to hurt you or harm you in any way, which certainly can’t be said or is true of many of the conventional treatment options. I’m particularly curious also. You had mentioned that when the patient is on the EECP machine, that there’s a compression of the blood vessels, obviously, and the venous system. But what about the lymphatic system? It would seem that would really flush out the lymphatics in the lower extremities.

SR: Yes. Whenever we do EECP, there are still a lot of patients that have edema. If you have a patient or many patients, they come up with the peripheral edema. A problem we don’t know if it is caused by the venous insufficiency in the lymphatic or [something]. But all the patients who undergo EECP for 35 days, they always come and say that the peripheral edema is gone.

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Probably, it not only reverse flow of blood in the arterial system and the venous system, it also has some impact on the lymphatic, which does not involve the limbs. Probably it should be studied, the effect of EECP on the lymphatic system.

**JM:** Yeah. It’s a marvelous thing. You know what, I also do an infrared sauna pretty much every day. One of the recommendations for infrared sauna is to do dry brushing, which is supposed to stimulate the lymphatic system. But I think that’s a far second choice compared to going on the ECP machine. You’ll really flush out your lymphatics with that.

Another observation I’ve made personally on the machine – I’ve had almost 200 treatments now – is that I try to empty my bladder before I go on the machine. But even though I do that, I still – I mean when I get up. Sometimes I have to stop the machine and empty my bladder, because my bladder just fills up. Is that a common experience? And why is that? Why does that happen?

**SR:** Yes. I mean it’s a common experience. I usually say if a patient wants to use the restroom often during the procedure, I would say their lower limb vasculature is very good. The reason is when you give this compression, I feel like there is an increase in coronary perfusion pressure around fatty muscle, which is high up. And then there is a 20-percent increase in the cerebral perfusion pressure. But if you look at the renal, it’s almost like 130- to 140-percent increase in blood flow.

**JM:** Oh, okay.

**SR:** That amount of blood flow can be increased in the lower part of the body. That’s why what happens is your GFR, glomerular filtration rate, shoots up, and then it increases your urine in the bladder, so you have to empty it often. Also because it increases the blood flow into the pelvic area, it’s also very effective in relation with erectile dysfunction.

**JM:** Much better than Viagra or its clones.

**SR:** Yeah. You won’t believe, but there are people coming to our clinic. We never even recommended it. There are people coming from Middle East only for erectile dysfunction.

**JM:** Wow. I was not aware of that. You are just an amazing fountain of information there. How about another indication that is an upcoming epidemic that we’re having a tsunami of? That is Alzheimer’s. It would seem that there could be some benefit there from a similar mechanism. You’re increasing vascular flow to the brain, or is that a misconception?

**SR:** Yes. It’s a very interesting concept and it has a great potential. For example, we have taken a lot of patients with senile dementia. Then we do many similar tests. Then when we do an MRI, we see multiple ischemic areas in the cerebral cortex. This is because we don’t have any micro vascular disease or micro vascular thrombi disease that’s causing multiple ischemic episodes that might lead to the disease.

When we do EECP, actually, as I said, there’s a 20-percent increase in the cerebral perfusion pressure. This increases the blood flow to the cerebral cortex also. We have recorded a couple of
patients who’ve come up with dementia. These are young people who are 55 to 60 years old. They come and complain to us and say, “I’m a teacher. I used to teach law. Now, I’m not able to recognize them.” My teaching ability has significantly dropped down.

We put them on the 34 days of treatment. We actually ask them to take the MRI again. The MRI shows that in two months on this multiple ischemic area on the brain. Then the patients came back and said, “Doctor, I feel better. I came from a cardiac disease too, but now I feel better because now I’m able to teach and I’m able to remember much better than before.” I think this should be a treatment for senile dementia or Alzheimer’s disease. We need a randomized trial. But I think our current actual results clearly states that it has a great potential in these two conditions.

**JM:** Okay. It’s another adjunctive treatment. Again, just like the treatment of heart disease or coronary artery disease, we would never recommend this as a magic bullet. But certainly, in conjunction with other effective well-known strategies – I’ve interviewed Dr. Dale Bredesen, who wrote the book *The End of Alzheimer’s: The First Program to Prevent and Reverse Cognitive Decline* before. He has a whole variety of approaches there, but this is one that he didn’t cover. It could be very useful, especially if you have any of the other diseases that we talked about. But the primary one, of course, is coronary artery disease.

If your doctor, a friend of yours or a relative has been recommending that you get a bypass, an angioplasty, or, God forbid, a stent, then this is something you really should seriously consider. Watch this interview a few times and look up other interviews online and information about ECP and seriously consider that as an alternative to the surgery.

Even if you have to pay for it out of pocket, it’s going to be far, far better than subjecting yourself to surgery, which does nothing to treat the cause of the disease. At least this is addressing the physiological mechanisms and giving you not just one, but hundreds or, as Dr. Ramasamy said, millions of bypasses all over the place, to the entire heart, and then erectile dysfunction, high blood pressure, diabetes and dementia. Are there any others that we’re missing?

**SR:** Yeah. I would explain EECP as a vascular reversal treatment. Anything that is related to vascular or blood flow, I think EECP can be worth it. As you also said, it is like an agility exercise on your vascular system. Any vascular disease usually responds to EECP.

**JM:** Yeah. The one I forgot was peripheral vascular disease or peripheral arterial disease, which can be very painful for many people. There are not a lot of good approaches, especially if you’re elderly and not really a good surgical candidate. I mean they can transplant the vessels, but that’s not a really good solution. Why don’t you just comment a bit on the treatment of this for peripheral arterial disease?

**SR:** Yes. Most of the patients who come in with peripheral vascular disease have severe claudication pain. The calf muscle is painful when they start walking because of the significant lack of blood flow to the skeletal muscle. During EECP, understand that EECP is not specifically any vessel. It’s a vascular reversal treatment.
What happens is that when you're pushing the blood so much in your vasculature, especially in the peripheral vasculature, as I also said, the decreased blood pressure is because of the vascular dilation. In this patient with peripheral vascular disease and claudication pain, when you apply EECP, there is a reduction in the peripheral vascular nervous system.

Also because of the compression, we are able to promote collateral in the lower limb. They can improve their exercise endurance. [inaudible 37:14] for the five minutes, they are able to walk 15 minutes before they get the claudication pain. Basically it is able to prolong this threshold from five minutes to 15 minutes or 20 minutes. The patient had less painful episodes. They are able to walk more distance without getting that pain.

**JM:** Excellent. Now, another emerging and becoming popular approach to heart disease is the use of stem cells. What really intrigued me about ECP initially and was a primary motivation for me to engage in the therapy was some suggestion that it could actually increase cardiac stem cells, just because of the mechanism, especially if you combine it with a near-infrared light source on the heart during the process. Can you comment on that?

**SR:** Yes. I think that stem cell is another field that is climbing very fast. There are a lot of studies done on stem cells. A lot of the problems with stem cells is that the stem cell that you inject into the coronaries or into the peripheral vasculature, somehow, the cell, which is supposed to be going to the myocardia and then stop stimulating the angiogenesis, somehow is not finding its way. [inaudible 38:30]. Somehow, it is not able to form in the place where we want it to go and home. It goes around in your body. It’s not going to be effective, because unless it goes and attaches itself to the myocardia, it’s not going to be effective.

Many times, when we use stem cells in a patient with heart failure, the heart is pumping so bad, so the blood transmission across your body is very low. The new stem cell is going to be running around [inaudible 38:58] in a very, very low blood pressure. It might not be able to find the way.

During EECP, we can create a hyperdynamic circulation for the stem cells to reach the coronary artery. Secondly, there is a new concept there of protein renewal, which is called laser-acclimated stem cells. They are talking about, somehow, they will teach the stem cells through some laser signal of where it should go and home itself.

They stimulate the cardiac cell with a laser, with the same laser they use to stimulate the stem cells. Probably, the stem cells are able to home into the myocardia so they are able to be very effective to clear the angiogenesis in the part where it’s supposed to be. I think combining the EECP with the stem cell would be the next feature to improve the EECP indication into other diseases also. Because EECP can create a hyperdynamic circulation, which is required for the stem cell to reach the area where it’s supposed to be.

**JM:** It seems to be useful in conjunction with stem cell therapy, but how about as a single modality where that’s the only treatment?

[-----40:00-----]
Has there been any observations or your impression that it actually increases stem cell activity and improves the heart in that mechanism by itself? Without any either autologous or other types of stem cell injections?

SR: That’s a very, very interesting question. Because they are talking about combining stem cell with EECP. But EECP is a one-way treatment, where you can actually stimulate the stem cell within your body.

When the blood flow increases, actually, in patients with ischemia, when we do EECP, naturally, EECP has stimulated the stem cells into the circulation. These are called CD34+ cells. The CD34+ are EPC, endothelial progenitor cells. These are actually the cells that we are trying to artificially inject into the myocardia or coronary vessels to increase the circulation. But during EECP, these cells naturally increase. And then it is very significantly shown in the blood sample.

Now, it has two important impacts. Number one, usually, these patients with ischemia or cardiovascular disease, if the stem cells do not increase naturally into the blood circulation, then they have poor outcome, because the body is not responding to the requirement for angiogenesis. But in patients with heart disease, naturally, the stem cell increases. They have improved outcome. They may have decreased [risk of] myocardial infarction or death.

During EECP, the stem cells have been shown to increase not only in the peripheral circulation, but also into the coronary circulation. This shows EECP has some effect on the stem cells to naturally increase, so it is able to promote what it is required, which is called angiogenesis.

JM: Wow. That’s great. It’s just like what I suspected. It’s an effective alternative to stem cell injections, which can be very costly. If you haven’t looked at them, most of the ranges are about 10,000 to 20,000 dollars for a stem cell treatment. The average cost for a course of ECP therapy is about 5,000 dollars. Frequently, both of those approaches aren’t covered by insurance, so it’s out-of-pocket expense. This has been magnificent. Are there any other comments you’d like to make on the therapy?

SR: Yeah. The stem cell won’t make another [inaudible 42:36]. The stem cell has been increased during EECP as a natural stem cell within your body. These stem cells have much higher frequency of homing into the myocardia similar to angiogenesis, rather than the stem cells you are injecting from the periphery or the artificially done stem cells. I think it is able to form these much natural stem cells because it has a much preferred effect on the myocardial angiogenesis than the peripheral stem cell [inaudible 43:04].

Secondly, I want it included in our EECP in 2017. I think when you found the connotation, you mentioned it. Now, in the management of chronic stable angina, it’s become like so complex. Because what is believed to be actually the best option, the stent, has failed to show in multiple trials – Trial after trial, the stent or the angioplasty has shown in chronic stable angina, cannot improve your quality of life. It has been shown in [inaudible 43:37] trials. It cannot improve your longevity, decrease the chances of death or decrease the chances of you getting a heart attack. This has been proven by other studies, like [inaudible 43:50].
Right now, you are in an area where you don’t have a treatment other than medical management in patients with chronic stable angina. Having an angioplasty over an optimal medical management in chronic stable angina has failed. It has no role because it cannot do [inaudible 44:10]. Now, EECP can be used, because it’s safe, non-invasive and effective. It has been shown in randomized studies that it can improve the quality of life.

EECP has three important functions. It can be initially used as a primary treatment. If you have diabetes, hypertension or hypercholesterolemia, you can take it as a preventive tool and improve your endogenous function to secrete more nitric oxide and restore your endogenous function to normal.

If you don’t use it as a preventive tool and you have a coronary heart disease and chronic stable angina, EECP may also play a major role because, again, it can improve your collateral circulation and angiogenesis. It can improve your blood supply to the ischemic area, without manipulating your coronary artery by bypass and angioplasty. This is the second.

Third, again, if you get a bypass and angioplasty and it fails because of the graft seclusion or the stent [inaudible 45:08], which is very common, again, EECP is the only option. Finally, the end stage. You did all these things. In spite of that, your heart is not able to recover from the shock and you go into heart failure. Again, EECP plays a major role. It’s a [inaudible 45:26] of indications, from prevention to end stage. I think that EECP should be used more than what is currently being used in U.S. and India.

**JM:** Sure. We talked about the use of it for coronary artery disease in the scenario where an individual was given a diagnosis typically recently and offered the option of having the bypass or an angioplasty. But what about those?

A far more common scenario, I believe, and I neglected to address this with you, is the fact that the person who’s had a heart attack or multiple heart attacks, and other than taking stents, hadn’t really undergone a surgical procedure. What does it do for someone who’s had a heart attack? Does it actually – Obviously, it’s going to increase the coronary collateral circulation, but will that ischemic dead cardiac tissue, will that recover? Or does it just remain permanently dead?

**SR:** Yes. When you have a heart attack, what happens is that you have an infarction, so your heart muscles are going to die. There is no metabolic activity that happens in the myocardia. The surrounding myocardium is also suffering from ischemia.

Ischemia is always associated with death. There are dead cells when there is ischemia. All of your procedures, whether it is a bypass surgery, an angioplasty or an EECP, they are able to recover this ischemic cell back to normal. But once the damage is done, which is happening in heart failure, I don’t think the EECP or any other influential procedure is able to recover or reverse the dead cells. For infarction, they usually go for fibril system. It cannot be recovered.

**JM:** Okay. But the ischemic cells that are surrounding the infarction can recover?

**SR:** Definitely. Yes.
JM: Okay. That’s good to know, because that’s a large group of people. I would imagine somewhere like the brain, which has neuroplasticity. Previously, up until a few years ago, we didn’t realize that it had that capacity.

But you could have a stroke, which is also a brain infarct, where they actually have a similar scenario. You have brain cells that are actually dead and necrotic. But the neuroplasticity implies that the surrounding areas can take up the responsibilities for those damaged cells. I suspect that there may be something similar going on in the heart, where the surrounding tissue can compensate for the damaged and dead tissue. Does that make sense?

SR: Yeah. When you talk about the heart failure and the myocardial infarction and death, actually there are two ways to treat it. Right now we’ve spoken only about increasing the blood flow to the heart muscle for restoring the ischemic area to normal, but then there’s another way that EECP can do.

What EECP can do is, because it dilates the blood vessels, it takes the load off the heart. The heart, which is supposed to be pumping harder to put the blood into the circulation now, doesn’t have to pump that hard, because your vasculature is all dilated. Basically, even with the damaged heart muscle, the heart can only [inaudible 48:29] because it does not have to put that much effort as before. Because after your 34 days of EECP, you’ve dilated all the vessels.

JM: Okay. Great. Any other insights you’d like to share before we sign off? Is everything covered?

SR: Yeah. I think we have.

JM: I think we covered most of them. I want to thank you for your time with us. I want to implore everyone watching this and remind them that cardiovascular disease still is the No. 1 cause of death in the United States and in most developed countries in the world.

If you or someone you love is in this scenario and you need to have an effective strategy to overcome it, of course you’d want to look at the dietary approaches first and exercise and lifestyle approaches that we talk about in the site. But if you need something rapidly and effectively as an adjunct that could really radically improve the mechanics and the whole recovery process, I couldn’t recommend this highly enough.

I’m absolutely excited to bring this information to you and implore you to look at the links below in this article, so that you can find a local center, get into treatment and get your body repaired. Because the technology – This didn’t exist 25 years ago. When I went to school, when I graduated medical school, this stuff was still 15 years away from being brought to the public. It’s available now, though. You can have access to it. It may be a bit of a challenge if you live remotely, but if you live in a large urban area, like many of you do, then it should be pretty easy to find.

Thank you so much for staying up late because you’re coming to us from India. It’s past midnight over there. We appreciate your diligence. I apologize for disrupting your circadian rhythm cycle.
SR: Thank you, Dr. Mercola. It was a pleasure talking to you. A very good discussion.

JM: Okay. Really good.

[END]