

BroadcastMed | Treatment of Mechanical Devices for Patients with Advanced Heart Failure (1 of 3 part video series)

DR. GAYATRI ACHARYA: Hi, I'm Dr. Gayatri Acharya at Mayo Clinic and I'm here today with Dr. John Stulak, cardiac surgeon specializing in VAD surgery, Dr. Sudhir Kushwaha, Director of the Transplant and VAD program, along with Ms. Sarah Shuttle, VAD coordinator at Mayo Clinic. Thank you for being here.

ALL: Thank you.

DR. GAYATRI ACHARYA: Today we'll be discussing the latest updates in ventricular assist device technology. Dr. Stulak, can you share with us the advances in the technology and what we have currently available?

DR. STULAK: I'd be happy to. There's been an exciting evolution through the decade, decade and a half, that the mechanical circulatory support has been available to patients. The first generation devices-- or the pulsatile devices-- really are not used anymore, and I have a collection of the second and third generation pumps here just for a little bit of demonstration.

This is the HeartMate II, it's an axial flow pump where this area here is inserted into the left ventricular apex. Blood is suctioned out of the heart along its axis and then returned to the ascending aorta. So it's axial flow. It maintains one direction. This is a very good pump.

The next one as you can see is a third generation pump. You can see that the whole direction of the field is to miniaturize the pump. This allows us as surgeons to employ alternate strategies of implantation, minimally invasive, and also you can see it would have implications for a bridge to transplant where there's less material to explant.

If you consider this pump, this is the Heartware HVAD, whereas you can see this is inserted directly into the left ventricular apex. Blood is suctioned out in this direction and then the rotor spins in a centrifugal manner and shoots blood out to the ascending aorta.

And then this one is the HeartMate 3. Again, it looks very similar in design to the Heartware HVAD. This clinical trial just ended in a very fast manner. So there's a lot of enthusiasm about this pump.

The rotor in both of these pumps do not interact with any of the pump housing or anything. And so the third generation pumps are thought to be more durable, even is thought to damage the blood cells less. So thrombosis and GI bleeding is even thought to be a lot less.

But here you can see blood enters here and is spun in a centrifugal direction and then out to the ascending aorta. So these are the pumps right now that we have available. And you can see again, the evolution has been to miniaturize the pumps-- so a very exciting time in mechanical circulatory support.

DR. GAYATRI ACHARYA: Absolutely. Dr. Kushwaha.

DR. KUSHWAHA: And the miniaturization is actually continuing so that the next generation of pumps is going to be even smaller. And so this is a technology which has continued to evolve, and continues to do so. And I would also add that we participate in most of the major trials of new devices going on. And we also have available for certain unusual situations devices such as the Total Artificial Heart, which is not used very frequently, but it's also available for the unusual situation where it might be necessary depending on the clinical state of the patient.

DR. GAYATRI ACHARYA: This is fascinating technology. Sarah, how do you explain it to the patients? How it's powered--

SPEAKER 1: Certainly. So a lot of patients come into mechanical circulatory support device therapy without a lot of knowledge about how these devices function and don't necessarily have a medical background. So we try our best to bring this down to a level that's understandable for each patient. We show them the devices, and being able to actually put their hands on the device that they're going to have, see what the batteries are like, how the whole interplay of these pieces work together I think really allows them to wrap their head around it and kind of understand what is this that is going to be happening to me.

We have a lot of really great educational videos that talk about what is it actually like to live with this device. You'll now have this cord that exits your body. How does that influence lifestyle changes? How can you do activities or even things like showering with this device, which you can do, but takes a little bit of practice.

So it's almost like adjusting to this alternative way of living, which can offer, as Dr. Stulak and Dr. Kushwaha pointed out, significant advantages regarding longevity with a device like this. But we certainly spend a lot of time-- hours with the patients-- not only myself and my colleagues but the nursing staff and all of the staff at the hospital, explaining exactly what this all entails and how patients can integrate their current life with therapy, with mechanical circulatory support device.

DR. GAYATRI ACHARYA: Great. Are there limitations from the standpoint of operation and powering of the device?

SPEAKER 1: So these devices are powered either with batteries, which are fully rechargeable, or else the patient can plug into wall power. So you can either use alternating current to direct current to power these devices. Most patients would like the ability and freedom to be able to do things in the community, interact with family members and friends. And so most patients elect to utilize battery support during the day. But during the night it's nice to not have to worry about changing a battery, so most patients elect to plug into an outlet to power their device while they're sleeping.

And certainly that transition is possible with these devices, and it gives them that flexibility to be able to go out and do the things that they enjoy. Limitations-- certainly post-operatively you have to be careful initially with lifting and how much you do, but we certainly do encourage activity and the progression of that as one heals from surgery.

DR. GAYATRI ACHARYA: Great. I know that we'll be speaking more about that shortly. Are there considerations that we have to think about as far as preparation for a transplant or even explanting the device? Dr. Stulak.

DR. STULAK: Yes, if the initial strategy of implant is bridge to transplant, then we are expecting that there's going to be a re-operation and an explantation at the time of transplant. For patients implanted as destination therapy, there are complications with these pumps. Around 10% to 20% of patients could have infection or pump thrombosis requiring explantation. So at the initial implant from a surgical standpoint we take many special approaches to always make the re-operation easier, whether it's a device exchange for a complication or for the subsequent heart transplant.

So from a surgical standpoint the implantation is not just focused at that operation but you're always thinking about the next operation, to make the next one safer and to minimize any complications that might be amidst.

DR. KUSHWAHA: I think the other point to make is that particularly in patients who have an implant as bridge to transplant, the physical condition of the patient sometimes going into the VAD surgery is really the manifestations of severe heart failure. So they may have been very ill, very cachectic, poor kidney function from poor perfusion to the kidneys because of the heart failure.

But after a period of VAD support, many of these patients have become rehabilitated to an extent that by the time transplantation comes along, when an organ becomes available for them, the post-operative recovery from the transplant is actually much easier because the general physical condition of the patient is so much improved compared to how they were. So that's another often unrecognized aspect of this therapy, particularly when it's used as bridge to transplant. Wouldn't you agree?

DR. STULAK: I agree completely.

SPEAKER 1: I think that speaks to the importance too of the education so patients know the things that they need to do to succeed to give them the best chance of having a reduction in these complications, even things like infection. We teach them in the hospital how do you clean the area where the cord exits your body to reduce the risk of infection. What are strategies like using things like a Foley Anchor or abdominal binders to secure the line to reduce the risks?

And so we really try to do a good job on the hospitalization side, and even on the outpatient basis, to reinforce and engage the patient in their own care so they can give themselves the best chance of success.

DR. GAYATRI ACHARYA: Great. And Sarah, what sort of feedback do you get from your patients after they've had a VAD placed as far as what activity they can participate in.

SPEAKER 1: Well, we have patients doing the full range of literally everything you could imagine. I mean we've had patients vacationing in Europe. We have a patient who runs a ranch that you actually worked with closely. And so we have patients that have done most everything that they want to do.

Certainly, there are limitations like you can't be a world class swimmer with an LVAD because of the cord that will exit your abdomen. But otherwise, I mean essentially a lot of things are permissible. You just have to think about how does that integrate with your VAD therapy and--

DR. KUSHWAHA: We have one patient who was a British transplant, successfully bridged, who was a young gentleman, and he was out playing tennis. I'm not saying that's the normal activity we recommend but because he was fairly athletic and very fit before he became ill, he wanted to resume that level of fitness and the device supported him for about close to two years. And he got transplanted and is now doing exceptionally well post-transplant.

DR. STULAK: I think these are all anecdotal stories but what referring physicians should know is the goal of this therapy is not just to keep patients alive. We know it significantly improves survival compared to medical therapy. However, the big thing is not only keeping patients alive but helping them feel better.

So every study you look at, there is a significant improvement in quality of life. So that's the piece where I think that some people don't really appreciate is we want patients yes, to live longer, but also to feel better.

DR. GAYATRI Absolutely. A great return to quality of life. Dr. Kushwaha.

ACHARYA:

DR. Yeah, I mean that's exactly right. I mean there are many patients who have basically resumed their jobs,
KUSHWAHA: resumed their physical activity, and really actively engaged in living, as opposed to actively engaged in being sick. And so that's an important transformation. And I think patients with Class 3B to 4 heart failure really have a tough time managing most most day-to-day activities, activities which we would take for granted. And this therapy allows them to really reengage, get back to a level of normality.

DR. GAYATRI Well, these are very important insights for our patients and referring physicians. Thank you very much for your
ACHARYA: thoughts and expertise. Thank you for joining us today.