

Frozen Elephant Trunk Procedure

Announcer: Welcome to the Mayo Clinic Cardiovascular Continuing Medical Education podcast. Join us each week to discuss the most pressing topics in cardiology and gain valuable insights that can be directly applied to your practice.

Dr. Friedman: Hello, my name is Paul Friedman. I'm chair of the Department of Cardiovascular Medicine. And today, I have the good fortune of being joined by my colleague, Dr. Malakh Shrestha, who is the Director of the Mayo Clinic Aortic Center of Excellence, Director of Aortic Surgery for Cardiovascular Surgery. Dr. Shrestha thank you so much for joining me today.

Dr. Shrestha: Thank you very much, Paul. It's a pleasure being together with you today.

Dr. Friedman: Dr. Shrestha, thank you again for joining us today. We're gonna talk about the frozen elephant trunk procedure, which has been an important advance in surgical management of aortic dissections, aortic aneurysms. But before we get there, let's review a little bit for our listeners. What are the most common manifestations, how are these diseases most commonly diagnosed?

Dr. Shrestha: So, although the aorta is one organ, so they can be various other diseases. For example, an aneurysm or a dissection. In the dissection, it's easy, because the patients will have severe pain. What the people that had it say that the most penetrating pain that one can have in life. So, they will have some sort of a very something, like stabbing pain in the chest. So they would immediately go to the doctor anyway. And then the easiest way, the quickest way, would we do CT scan with contrast, to see if there's a dissection in the ascending, and the arch of the aorta. So that's easy there. It's always the CT scan is the best thing. But also we also need an echocardiograph, to see whether the aortic valve is involved, if there are other valves involved. So that's the second test that we would need to do. In case of aortic aneurysm, again, to see the dimension of the aorta, CT scan is the best, with, with contrast dye. But also we could do, especially in younger patients, with Marfan patients, we are doing the follow ups, then an MRI could also play a role there.

Dr. Friedman: So it's suspected from the symptoms, and rapidly go to imaging, to enable the a lifesaving surgical intervention. which brings us to our next question. I'd like to talk to you first about the frozen elephant trunk procedure. What exactly is that procedure, and who would benefit from it?

Dr. Shrestha: So the frozen elephant trunk procedure, is a technique that was developed about 23 years ago, to treat complex aortic arch pathologies, both chronic dissections, acute dissections, and also aneurysms, whereby one had a prosthesis, that you can replace the whole of the arch, and put a stent in the descending aorta, so that the patients, at least some of them, can be treated with one stage procedure, and in some of the patients, even if they do need a second stage procedure, the second stage could potentially, in many of these patients, be endovascularly treated.

Dr. Friedman: Tell me about the invention and creation of this procedure.

Dr. Shrestha: So the classical elephant trunk procedure was also developed in Hanover, where I spent the 26 years, before coming to Mayo Clinic. Professor Hans Borst, in 1982, came up with this so-called elephant trunk technique, which was a revolution for that time. Then around the turn of the century, with new technology with stents, we developed this frozen elephant trunk technique. And spacially, in 2000, between eight and 10, I along with one other surgeon, actually developed the thoracic graft, together with Tero Miortic, which has finally now, after 25,000 implants all over the world, been approved by the FDA to be used in the US, as of last year.

Dr. Friedman: I see. Well, congratulations on finally getting that approved in the US. It seems like it will open up options. What are the advantages of this approach, compared to the other approaches? And maybe before we talk about advantages, you mentioned it was for aneurysms and dissections. Any other indications that we should also be aware of?

Dr. Shrestha: So it's mostly for the aneurysms, and the acute dissections, and also the chronic ones. In the aneurysms, as long as there's a landing zone, then that means in the descending aorta, with this graft, one could treat the patients with a single stage procedure. It'll still be one open surgery, but they would not need a second stage procedure. For the acute dissections, although it's a big operation, you know the acute dissections are the biggest emergencies that a cardiac surgeon can face, so with this graft, if we treat the arch, and put this stent in the descending aorta, then these patients, we have shown over the last 20 years, do not come back, at least for the arch, and the descending aorta. If they do come back for the lower part of the descending, they can still be treated with the TIVA. So that means for the patients, either they don't come back, or if they come back they need only the TIVA, because we know that in acute dissections, if we don't touch the total arch, or with the frozen elephant trunk, up to 30% of these patients come back for a redo arch.

Dr. Friedman: I see. So it seems like the main advantage then, is, one open surgery treats the problem, with a risk, a small risk, but a risk, of needing an endovascular procedure down the road, but the open surgery is more definitive.

Dr. Shrestha: Yeah, correct. Because they need one open surgery anyway, for the first stage.

Dr. Friedman: I see.

Dr. Shrestha: So that does away with the second one.

Dr. Friedman: I see, okay. Now many of our listeners will be cardiologists, as well as other specialists, who are not practicing cardiac surgery. So one of the questions would be, is there anything special, or any considerations during follow up, of a patient who's had a frozen elephant trunk procedure, findings on physical exams, specific imaging studies that are useful? What should the cardiologist know about treating a patient following the procedure, both early afterwards and longer term?

Dr. Shrestha: So for the follow up, what I would advise, would be to get a CT scan before we start, So we have a baseline CT scan, and then depending on whether it's an aneurysm, maybe one after six months, and yearly afterwards, and in acute dissection, maybe three to six months,

and then yearly afterwards. And here, because you have done so great job with artificial intelligence, I think a role could be there, because otherwise, a radiologist would have to spend a half an hour, going through the CT scans, if we could develop some sort of, you know, protocol for that also, that would really help, especially for the radiologist in smaller hospitals, to do the follow ups. And that would save the patients, you know, having to come back to Mayo Clinic or bigger centers. And also sometimes, the computer would not miss what sometimes the doctors may miss.

Dr. Friedman: No, that's a phenomenal suggestion. What are the complications that the cardiologists following a patient should look for, and how common are they?

Dr. Shrestha: The complications would be not the graft itself, only because the aorta is diseased, then the cardiologist, or any follow follow up physicians have to look for, it's whether the aorta is dilating in follow up. So if it becomes larger, and larger, and more than let's say six centimeters, then we may have to do a reintervention again. So that's the most important thing.

Dr. Friedman: Got it. Got it, okay. Now you are a co-inventor of this. How many of these procedures have you done?

Dr. Shrestha: I myself have done, I haven't counted, but around 300 plus of these.

Dr. Friedman: Yeah.

Dr. Shrestha: This is one of the, at least in the Western world, the largest series I would say. But worldwide, more than 25,000 have been done with this graft alone. So this is a big number.

Dr. Friedman: No, that is remarkable. Well, Dr. Shrestha, thank you so much for joining us today. It is remarkable how these surgical improvements are improving outcomes, and your leadership has been so important for the Aorta Center, for helping us have frequent reviews of diagnosing, detecting, and treating aortic pathology. So thank you for your expertise.

Dr. Shrestha: Thank you, Paul. Thanks again.

Announcer: Thank you for joining us today. Feel free to share your thoughts and suggestions about the podcast by emailing cvselfstudy@mayo.edu. Be sure to subscribe to the Mayo Clinic Cardiovascular CME podcast on your favorite platform and tune in each week to explore today's most pressing cardiology topics with your colleagues at Mayo Clinic.