

**Melanie Cole, MS (Host):** Welcome to the podcast series from the specialists at Penn Medicine. I'm Melanie Cole. And joining me today is Dr. Chase Brown. He's the Surgical Director in Coronary Revascularization at Penn Presbyterian Medical Center, and an Assistant Professor of surgery at the Hospital of the University of Pennsylvania. And he's here to discuss his personalized approach to coronary artery bypass grafting, or CABG.

Dr. Brown, thank you so much for joining us today. We're discussing a relatively new procedure called robotic minimally invasive direct coronary artery bypass, or RA-MIDCAB, for single vessel coronary artery revascularization. And we're also discussing its application in a hybrid procedure for multivessel disease. Before we get into these surgeries, I'd like to remind our referring audience that Dr. Brown's program can be reached directly at 215-662-9595.

Dr. Brown, can you provide a little background on the anatomy of coronary artery disease and the way that it's been treated? Give us a little history.

**Dr Chase Brown:** Thank you. I'm happy to be here and I'm excited to discuss this topic with you. So historically, coronary artery disease has been treated with medications and with stents and with open surgery. Patients with triple-vessel disease who have angina and ischemia have gone on to undergo CABG procedures or coronary artery bypass procedures. If it's limited just to the LAD or the left anterior descending artery, oftentimes these patients will have a stent placed by their interventional cardiologist, especially if it's proximal disease. Also offered would be coronary artery vascularization with open sternotomy with a LIMA, the left internal mammary artery, anastomosed past the blockage to the LAD. But recently, over last 10 years, there's been this evolution of using robotic technology, small incisions, to provide minimally invasive approaches to patients with coronary artery disease.

What we can do now is use the robot, and we use three small incisions in the chest wall, one for the left hand, one for the right hand, one for our camera port. And using the robot, we can harvest the left internal mammary artery off the chest wall. We then remove the robot, and we make a small left thoracotomy. And then through that small incision, while the heart is still beating, we complete an off-

pump, off-bypass anastomosis of the left internal mammary artery to the LAD. And this approach is great because this is a very small incision. Patients do very well from this approach. They can go home in two to four days, and they're usually back at work anywhere from two to three weeks, unlike two to three months with open sternotomy approaches.

**Host:** Well, thank you, Dr. Brown. So, what differentiates RA-MIDCAB from traditional coronary artery bypass grafting, or CABG, surgery? Speak a little bit about the advantages from both the surgeon's point of view and the patient's.

**Dr Chase Brown:** Yeah. So when patients come in, they often hear about a sternotomy and how much pain this is going to cause and how long the recovery is. And we often tell patients with a traditional sternotomy, which is an incision down the front of the chest to open the breastbone, patients are going to have two to three months of healing process. And even research suggests that even at two months, the sternum is not 100% healed completely. So, patients often ask, "Is there any sort of minimally invasive option?"

And often times they hear about stents and what the cardiologist can provide with stenting. But the research that we have would suggest that for patients that are young, that can avoid a sternotomy, we can do a LIMA to LAD to bypass the proximal LAD lesion and avoid this open incision. And this is very good for young patients, patients that are active and don't need or want or can take 2-3 months off of work. We can provide a small incision in the left chest and this will allow them for a much quicker recovery. I often tell patients, after two weeks, their pain is much better. And then at that point, they can go back to regular activities without really any restrictions. The only restrictions they have is usually some soreness that will keep them from being able to lift, you know, a box over their head. But unlike a sternotomy, which we would say, you cannot lift anything more than 10 to 20 pounds for two to three months, with this small minimally invasive incision to treat coronary disease, we're actually able to get them back to work or without any restrictions after two weeks.

**Host:** You mentioned younger patients. Expand on patient selection for us, Dr. Brown, for the ideal patient for RA-MIDCAB surgery because many surgeries are

now performed for particular patient populations, which is ever-expanding in this exciting time in your field.

**Dr Chase Brown:** So, I think there are a couple of different groups of patients where this procedure works great for. The first is a young 40 to 60-year-old patient. These patients often come into the office. They're very active. They're running and they say, you know, I used to run a 9-minute mile, now I'm running an 11-minute mile, and they have single-vessel disease. So, to do a sternotomy on this patient is a lot because the restrictions they would have going forward would be pretty severe. They wouldn't be able to lift heavy weights, they wouldn't be able to run for over a month or so. So, that's a great patient to offer this minimally invasive robotic approach where we can do a robotic harvest of the left internal mammary artery, a small left thoracotomy that is a couple inches in length.

After we anastomose without the heart stopped, the patient will have the breathing tube taken out in the operating room. They'll stay one night in the ICU and then go home on post-op day two or day three. And if you're young, this is a better approach than getting a stent. If you get a stent in your 40's, 50's for proximal LAD disease, that will help momentarily. But especially if you have diabetes, we know there are issues with in-stent re-stenosis and complications of stents for long periods of time for patients who have a lot of longevity left. So, this approach is very good for a young patient.

The other group of patients where this works well is patients that are older, that have a lot of comorbidities, where doing a sternotomy would be less than ideal. And the recovery time with a sternotomy would be difficult for them. So, this would include patients with obesity, patients with severe COPD, patients with lots of comorbidities where the recovery will be difficult. So in these patients, we can do a LIMA to LAD for proximal LAD disease or this gets to another part of the conversation which we'll talk about, which will be the hybrid aspect where I can do the LIMA to LAD robotically. And then, our interventional cardiologists can stent the obtuse marginal or something in the circumflex or something in the right coronary artery. And this avoids a sternotomy in these sicker patients who would benefit from a LIMA to LAD, but would not do good with a traditional surgical approach, which would be a traditional sternotomy and multiple bypass grafts.

**Host:** Dr. Brown, what's the role of multidisciplinary heart team in procedure planning for CABG and these other surgeries, and even after the fact? Tell us a little bit about your team and the importance of this multidisciplinary approach.

**Dr Chase Brown:** We have a heart team for all patients that undergo coronary bypass grafting. And it usually starts with the patient's cardiologist. They usually will talk to the patient and say, "Listen, you have disease in your coronary arteries that's limiting your life in terms of angina" or "You have ischemia, which will decrease your longevity and your survival." And then at that point, they usually get sent to a interventional cardiologist who will do a left heart catheterization and will discover where these flow-limiting lesions are and what vessel is the culprit.

Once we have the anatomy, the interventional cardiologist usually refer them to meet a surgeon. And we will discuss with the interventional cardiologist what a good plan is. And on these patients that are younger, or even the patients that are sicker, we have to come up with a plan to see what is best for each individual patient. And for the robotic approach, it will either be, "Should we stent this patient?" Or "Should this patient undergo a Lima to LAD robotically?" So, that would be one of the big conversations we would have as a heart team. And oftentimes if the patient is young and a candidate for the robotic approach, that's the route we prefer to take. Because the LIMA to LAD will provide great blood flow to the left anterior descending artery for their lifetime with a very low risk of disease in the LIMA graft.

**Host:** Dr. Brown, I'd like you to tell us a little bit about the hybrid procedure you're performing, which combines RA-MIDCAB with percutaneous coronary intervention and its advantages. I'd like you to speak about that and any technical considerations you'd like other providers to know about since this is so unique.

**Dr Chase Brown:** So, for this approach, in patients who would go down the hybrid route, this would be a LIMA to LAD robotically, and then one of the other vessels would be stented. And sometimes you could stent two vessels if needed. It all depends on the patient, the patient's preferences, and the patient's comorbidities.

What we don't want to do though is convert a procedure, which traditionally is patients with triple vessel disease who would benefit from open sternotomy and multiple bypass grafts, so at least three or more bypass grafts, into just a LIMA to LAD and multiple stents. I do still think there's a role for traditional surgery. But I do think that this new technology that allows us to provide coronary artery revascularization surgically in a minimally invasive approach to patients who would not be candidates for open surgery, it's excellent.

So, the big thing we need to decide when discussing what route this patient should go in terms of stenting, surgery or hybrid approach would be timing. So, the issue with stents is they will need to be put on an anti-platelet agent such as Plavix or Brilinta and taking that patient to the operating room and doing the minimally invasive approach, robotic approach, there would be an increased bleeding risk. So, it's a conversation we need to have. Is there a culprit lesion that needs to be stented first or can I do the LIMA to LAD lesion robotically, and then send them back to the interventional cardiologist who will then put them on Plavix after my procedure. Those are the main conversations that we need to have. But this approach will allow us to revascularize patients who are not candidates for open sternotomy with a LIMA to LAD. And then, the interventional cardiologist will go ahead and stent the other lesions. And this patient who traditionally would have lots of limitations and many months recovery can usually go home a lot quicker and oftentimes will not need to go to acute rehab.

**Host:** This is a fascinating topic, Dr. Brown. So finally, please tell us a little bit about the robotic program at Penn Cardiovascular Surgery. What would you like referring providers to know about the program and how can interested providers reach you for a referral?

**Dr Chase Brown:** Our program has existed probably over the last five years. But since I was hired back in July of 2023, this has been my main focus. So, I've really tried to expand our program to not only different types of patients, but increase our hybrid program and also reach out to patients who often get stented and get those referrals as well. So, the best way for patients or for providers to contact us would be to reach out to my office directly. My office number is 215-662-9595. And I would be happy to see those patients and have a conversation with you and

our interventional cardiology team to determine the right approach for each individual.

**Host:** Thank you, Dr. Brown, so much for joining us and sharing your expertise on this topic. To refer your patient to Dr. Brown at Penn Medicine, please call our 24/7 provider-only line at 877-937-PENN, or you can submit your referral via our secure online referral form by visiting our website at [pennmedicine.org/referyourpatient](https://pennmedicine.org/referyourpatient). That concludes this episode from the specialists at Penn Medicine. I'm Melanie Cole. Thanks so much for joining us today.