We've gotten very good at, I think, is looking at indirect markers, either upstream of heart disease or downstream sequela of disease, but we've never really looked at the disease itself.

So if you say, well, what is heart diseases? You commonly hear patients walking on the physician's office saying, oh, my doctor told me I have a blockage.

But fundamentally, the blockages are the problem. The block is a sequella of the plaque that builds up silently within the walls of your heart arteries over many, many years.

And it's called atherosclerosis. This is Dr. Talks. Hello, everybody. Sit down, get excited right now. Welcome back to Reverse Your Heart Disease Naturally Summit, Joel Kahn.

We have a world expert. I'm so excited. It could be the number one, and I don't want anyone else to be offended. Most important interview of the entire summit, because you cannot have a reverse your heart disease naturally summit if you can't actually talk scientifically academically, that you CAN reverse plaque.

In the last decade, I've been using a digital carotid ultrasound called a CIMT, and I see my patients' plaques get smaller and smaller. But that's a brain artery, a very important one.

I have not had a technology to do that in heart arteries. I'm bringing you now Dr. James Min, who is the world's expert on how you document reversal of plaque, transformation of plaques.

So this is really an important session. One that may be very important to you, Dr. James Min is founder and CEO of Clearly, a healthcare company in the digital care pathway space, supporting physicians and patients to reduce their risk of heart attacks.

Prior to being CEO, Clearly he was full professor of radiology, medicine, cardiology at the Weill Cornell Medical Center in New York. and Director of the Institute of Cardiovascular Imaging in New York, Presby Hospital.

Dr. Min is on every society in the world of radiology and imaging, published over 500 papers. He's a young man, a Young Doctor. That is so many hours of work.

I'm in awe. He's led more than 10 of the most important clinical trials on imaging of heart arteries. He is literally changing the paradigm. I just want to stress everything grandpa knew, Dr.

Min is rewriting the book. So James, Jim, without further ado, thank you for being here. Oh, thanks so much, Joel. It's a pleasure to be here Truly the enthusiasm is high and it's been fairly easy to try and throw out the term precision medicine.

And I give credit to the great Tony Robbins and his book Life Force of early 2022. really dedicated to enumerating pathways of precision medicine. And they're highlighted probably more than any other technology is your company clearly cardiac imaging.

So hats off to you. I had the pleasure of interacting with you this week to prove to a patient. that all the hard work they're doing is shrinking their plaque and their heart arteries.

And we did that with your technology. So this is very personal to me about how it's changed my practice, but let's start basic, basic. What do we measure today to diagnose heart disease?

What are the indicators we're using that just aren't optimal? All those years you were involved in cardiac imaging in New York. Yeah, it's a great question.

I trained as a cardiology fellow at the University of Chicago about 20 years ago, and everything that I was taught doesn't work in a precision way, as you pointed out, in personalized fashion.

What we've gotten very good at, I think, is looking at indirect markers, either upstream of heart disease or downstream sequelae of disease, but we never really looked at the disease itself.

So if you say, well, what is heart diseases, you commonly hear patients walking on the physician's office saying, oh, my doctor told me I have a blockage.

But fundamentally, the blockage isn't the problem. The blockages is a sequela of the plaque that builds up silently within the walls of heart arteries over many, many years.

And it's called atherosclerosis. What we thought 10 years ago, 15 years, ago was that there was a single phenotype. It turns out athroscleroses like cancer is many different types of disease.

They carry very, very different clinical importance that we learned through a number of large-scale clinical trials over the course of past decade or so.

So in sum, we are really great at looking at these risk factors of disease like cholesterol and blood pressure and diabetes, which doesn't actually look at the disease itself, but is more an association to the diseases.

And we're very good at downstream sequelae of diseases like a blockage or a narrowing. But we've never actually looked at the disease clinically and that's what our company focuses on.

I think the simple analog, oncologic analog is if I were a woman and I was worried that I had breast cancer and somebody checked my lymph nodes in my axilla or they checked a blood test and said, hey, you look fine.

And the woman says, but you've ever examined my breast for breast, cancer that would, people would think that that will be absurd. But that is exactly what we'd been doing in cardiology for the last 70 years.

Well, absolutely. And some of the listeners may know, for example, Framingham risk score calculators, American College of Cardiology risk calculaters, numbers, age, blood pressures, your prediction of having heart disease, but never examined the breast in this case, the heart arteries.

We're changing that. But somebody's listening right now and saying, But I had a heart cath and they told me I have a 50% blockage before we go to precision medicine.

Let's talk about that. Somebody went through an invasive procedure. You're 50% narrowed, Mr. Jones, Mrs. Smith. I mean, how optimal or suboptimal is that measurement?

I think it answers a different question, right? So 20 years ago, again, when I was training, what we were taught was that symptomatic patients with chest pain or shortness of breath are the ones that are at risk for heart attacks.

And if we can relieve their symptoms, we'll reduce the risk of heart attack. That turned out to be wholly untrue. What we've learned through at least seven large-scale randomized controlled trials is that when you relieve symptoms that's all you do is you relief symptoms but you never reduced the risks of hard attacks And so the blockage, I think is an important metric.

If you're asking, Hey, is blood flow being reduced because of that block that's causing the symptoms? That's an entirely different question than how do I prevent myself from having a heart attack?

And that question is related to the disease itself, which is the atherosclerosis or the plaque buildup in the artery, the walls of the. And you probably remember the studies during your training that were actually done in the 1970s, going back to Mrs.

Jones, Mr. Smith, vice versa, 50% narrowing on a heart cath. That's a visual eyeball estimate by a trained doctor. But when you give that same image to 10 different cardiologists, It's not precision medicine.

You can get a very wide range of visual estimates and the person listening now as a 50% blockage thinking could be 30, could it be 75. Depends who's looking at it and lighting in the room and your caffeine intake that morning.

It is not precise. And that's what I explained to patients. So let's go on to what are more direct measures of heart disease beyond both visual eyeball and cholesterol, blood pressure, and blood sugar.

What are more direct measures? Yeah. I think that about 30 years ago, we saw the introduction of a technology called a coronary artery calcium score. What that is, is a very safe, non-invasive way to look to see whether or not you have calcified or calcifications building up within the walls of your artery.

We know that califications are essentially like rocks. that are embedded and studded in the walls of the artery. And we utilized that technology at the time, 30 years ago, because it was the best we had to be able to visualize what is actually happening, not within the vessel itself where the blood is flowing, but within a wall of artery, what I think the listeners need to know is that nearly 70% of patients who will have a heart attack will never have severe narrowing, a significant blockage in their arteries.

But our field of cardiology has been so focused on looking for these severe narrowings, 50%, 70%, 90%, when actually the vast majority of the people having heart attacks have less than 50% narrowing, they don't cause symptoms, abnormal stress tests.

And so the coronary artery calcium score was a way to visualize one type of plaque in the arteries. What we've learned over the last 10 years is that that type is actually associated with a lower risk of heart attacks than the other type, which is the non-calcified plaque.

And the non-calcified plaque is also an array of different types of plaque, but they tend towards being more fatty and cholesterol filled. They're softer, right?

In some sense. And, the way that we used to explain it to the patients is that what we found in the trials was that the, non calcifying plaques really connoted the greater risk of having a heart attack.

The calcified plaques, like once they become very dense and biologically inert, are associated with a lower risk of heart attacks, which conjured up this question of like, well, then how do you turn the non-calcifying plaque into calceified plaque?

And it turns out that at least today, almost everything that we do that's good for patients seems to convert or transform that plaque. They include things like statin medications, like increased physical activity, a low sodium diet, PCSK9 inhibitors, fish oil, all of these things.

They serve in some cases to regress, but in the majority of cases, to transform the plaque. And you were just mentioning, Dr. Khan, one of your patients in whom the plaques regressed.

And I think I can explain or unify both of the things that you just observed and what I just said. Because if you take like, let's say you'd take a bunch of gunky mud and you equate that to the non calcified plaques, and then you start to dry it up and start make it denser.

And then, you turn it into a rock and turn into coal, then turn to a diamond. Well, what happened is that you've transformed the plaque. But it's like if you took a sheet of paper and you crumbled it all up, the apparent volume of that plaque has now gone down.

It was from a transformation of soft mud into the hard diamond that made it look like the volume reduced, but it was really through the transformation more than anything.

I think that's what the previous studies are supporting. Okay, fascinating. And there's so much to unpack there. So we have had a wonderful conversation with a good friend of yours, Matt Budoff of Harbor UCLA.

We talked a lot about calcium scoring, but again, we've gone from imprecise risk factor calculators to a calcium score 30 years ago that at least gave some direct measurement of part of the plaque that can be an arteries, the calcified portion of plaque.

But you and clearly have gone beyond that recognizing that calcium scoring has major deficits. You don't see soft plaque, you don' see the most dangerous plaque so tell people what is a clearly coronary CT angiogram.

It may be briefly what does a patient go through and what do you do with it in New York City when the digital images arrive for your analysis? Yeah, it's a great question.

So I was talking with Dr. Arthur Agatston last week. He's the inventor of the coronary artery calcium score. And he refers to the calcium deposits in the walls of arteries as the old plaques.

But as you think about what you had discussed with Matt Budoff, there's an age dependence to this, to calcified plaque that younger people tend to not have as much calcium and it's really as we get older that the plaque gets older.

What we want to do is identify as, you pointed out, the dangerous plaqs which tend be the non-calcify plaques. So the only way you can do that is non-invasively in a routine way is using a coronary CT angiogram.

So it's a very safe, noninvasive procedure. At any good site, it probably takes all in about 15-20 minutes to do the procedure, The actual picture of the heart takes less than a second to cover the entire heart and all of corner arteries.

You have to use a little bit of contrast, iodine contrast agent so that you can opacify the arteries and visualize the wall and see the non-calcified plaques.

In our case, we use that coronary CT angiogram. So at any clearly enabled CT imaging facility, if somebody gets the CT scan, We automatically ingest that into a computational cloud where we can use high powered GPUs to analyze all of the data and a series of machine learned or AI algorithms process all the, data to really get down to the sub millimeter scale to tell somebody exactly what type of plaque is there, how much plaque there is, where it is how diffuse it, is How it affects the artery both on the outside as well as the inside of the arteries.

So all of those quantitative metrics are delivered back to the user in about an hour or so. So amazing. And as a person who chose last year to go through a clearly health CT angiogram, no problems, but I'm a guinea pig for cutting edge heart technology.

I got an IV in my elbow portion of my arm like they were drawing blood. I laid down and relaxed very comfortably in the CT scanner. I got hot for about 20 seconds as the iodine dye went through my vein and into my heart and then ultimately it ends up exiting the body through the urine over the next hour or so.

So I held my breath for 20 second and after that I got a Band-Aid and went home, drank a little bit of water and Got a report the next day. And where it was different from my calcium scoring CT scans was your company tells how much hard calcified plaque in cubic millimeters.

It's amazing, artery by artery. How much soft, non-calcify plaque, in cubic millimeters, arteries by arteries. The total of the plaque, of which I'll proudly announce I had nearly none, which was great.

And then finally, if there's a narrowing in the artery, it's not that cup of coffee eyeball 50%. It's 17%, 21%, 22%, 74%, depending on what it is. It is the precision.

I don't even know what a GPU is, so you're going to have to tell me I know a CPU is. But that's all done through

algorithms and artificial intelligence software that you created, patented, sort of super genius that your are, right?

Yeah, it is like it's AI algorithms, but I want the listeners to understand that AI or machine learning is just a tool, right? Like we have done conventional image processing in the past.

This tech, this tool does it better, there's nothing magical about it. It's still mathematics and processing of the images. The other thing that I'd emphasize Joel is that, you know, your sophisticated, The folks who will get undergo the clearly analysis actually don't have a medical background.

And so what our company has done is we spent an enormous amount of time, thought and effort to take the advanced imaging science that does the phenotyping of disease or characterizes the disease and translates it so that anybody can understand it.

I think that's a very important point. If I told somebody off the street, Hey, you've got 173 cubic millimeters of plaque. Let's say, okay, what does that mean?

Well, if you don't know what that means, then it's not helpful to you. So what we've done is we made patient-facing tools, primary care physician-facing tools.

General cardiologist- facing tools even tools for the radiologist, the interventional cardiologists, preventive cardiology and so on. We can translate the advanced imaging science into insights that people actually can act upon on a daily basis at home and fully understand.

Yes, I think it's really novel. Everybody needs to listen to this. Hopefully we don't face that day we're talking to an oncology cancer specialist and here we have stage three pancreatic cancer or stage four breast cancer.

But we never talk that way to cardiology patients. Intuitively, we know mild and we no horrible, but we do not speak that language. You've translated this quantitative data into stage one through four coronary artery disease.

This is a paradigm shift, so it's going to take a while for cardiologists to start talking that way. But I can tell you, as a practicing cardiologist, it grabs people's attention when the report says stage four atherosclerosis.

And they're way more likely to change their diet, get on the right prescription drugs, change the lifestyle, and hope to see in a year, if we repeat the clearly CT angiogram, that shrinking, particularly soft plaque, that taking that piece of paper and grumbling it like you so nicely said.

So I mean, who should get a clearly analysis? What's your, I think people say your avatar? Who's you're perfect candidate? Yeah, I think that right now coronary CT angiograms are covered by almost universally by both commercial and Medicare payers for patients who have symptomatic suspected heart disease, chest pain or shortness of breath.

And our technology layers on top of that to really help illuminate what's going on in somebody's heart at a precision or personalized level. I think that what we've demonstrated is within the workup of a symptomatic patient, that definitely can reduce the total costs of care to the healthcare system while providing more and useful clinical information.

If you look at the data, nearly 60% of the people who will suffer a heart attack or die from one actually have no symptoms. And so how are we going to prevent heart attacks if we never actually evaluate patients who are at high risk but do not have symptoms?

I think what we need for that is large-scale randomized control trial data to really influence policy guidelines and professional societal guidance documents.

So our company is committed to doing that. We've designed two large scale randomized trials to focus on the asymptomatic person who is at risk. Think about this question.

Why do we use advanced non-invasive imaging to prevent the most common cause of cancer, but not the common causes of death? It doesn't make sense. We use mammography and colonoscopies.

The number one cause is coronary heart disease from fatal heart attacks, or in the end from the sequel of non-fatal heart attacks. We've got to find these people.

It is the number one public health epidemic. Somebody will die of cardiovascular disease in this world every 1.7 seconds. In 2020, there were two-fold more cardiovascular deaths than deaths from COVID-19.

I mean, that's how big this epidemic is. And so I think that for those who are concerned and have the wherewithal to be able to offer themselves the clearly analysis, I you'll do a huge service to yourself to figure out whether or not you have disease or whether or not you don't have a disease, in which case it's very reassuring, such as in your case.

So my personal experience having ordered dozens of clearly CT angiograms on patients, and I'm licensed in about 30 states, is if a listener lives in LA, no problem.

We can arrange it. Lives in New York, No problem, lives Florida, Texas. Anywhere where there's a high quality hospital or imaging center with an advanced CT scanner, you can get a coronary CT androgram and either mail the CD to New York or transfer the images digitally.

And you don't have to go see Dr. Min physically in New york city. You just got to get your data there. Most of my patients have paid for this. A very cross section of economics in my practice, but they've understood after I explained it, the value of precision cardiology.

Is there very commonly People that are very interested in my experience have had a calcium score abnormal. Is there a cutoff where if the calcium scores over X, it may become difficult to get a good standard coronary CT angiogram, which therefore means it might be difficult Yeah, it's a great question.

I don't think there is any threshold. Like when we practiced at Cornell Medical College and New York Presbyterian Hospital, we would take anybody independent of their calcium scores.

A high calcium score, as you know, but for the listener's sake is severely elevated as considered at the threshold of 400. We've done coronary CT angiograms on patients with calcium, scores of 9,000 have gotten pristine results on those coroner CTAs.

Well, that's good to know because there are centers and certain other physicians that will say over a thousand reconsider, but you're the world expert and I'm going with you.

And of course, a severe light threatening iodine allergy would take somebody out of the selection usually. And of course, advanced kidney disease because of the need to clear the dye through healthy kidneys.

So it's a small subset. I've not yet encountered anybody I couldn't get a clearly CT on, but it is absolutely transforming. Now we have this technology, preventive cardiologists, prevention medicine doctors, the public who say, I want to know exactly how much black is in my coronary arteries.

what kind of black, what stenosis burden I have, even though the stenoses is not ideal at predicting future heart attack, it obviously is of concern to patients if they're 20% or 70% black.

And the result comes back and somebody has stage four coronary artery disease, their total black volumes 900 cubic millimeters and their 48 years old, that's a patient I'm thinking of in my own practice.

What does the treatment paradigm entail now that we've identified their phenotype, a term you used, as very advanced, very high risk? Yeah, it's great question.

And it is very relevant today. Five years ago, we had a very limited armamentarium in our toolbox. Essentially we have statin medications and maybe Zetia or Zettamide to lower your cholesterol.

That was about it. In the last five years, we've seen the introduction of at least a dozen different classes of medications that have all been demonstrated to reduce heart attacks and other major adverse cardiovascular events.

So now the toolbox is very heavy. But the problem is we don't actually know. who to treat. We know that the risk factors that we have used are inadequate to figure out who is actually successfully undergoing therapy or not.

Let me give you an example. Like, let's say you take a statin medication. What a Statin medication is associated with is about a 20% relative risk reduction in having a future adverse heart event or a heart attack.

That means that that's 20%, after you lower the cholesterol, That means it implies that there's 80% of people who have residual risk that we don't know who's not responding to the medications because you've put them on the medication, you lower their cholesterol, and yet four out of five people are still at risk.

So the simple solution is measure the disease. Don't measure an indirect marker of the diseases. And then in addition to all of these medications that are truly blockbuster medications, We tend to forget about lifestyle modification.

There's so much lifestyle things that we can do to improve heart health. They relate to not only activity, but also to stress, to anxiety, sleep, diet.

So there's a whole number of things you can approach. But I think to look at the patient as a person, rather than just the lab number and say, hey, we're going to give you some medications.

Let's try to design the optimal lifestyle and then try and control all of the propagation of disease over time. And then, as you said, it's very quantitative.

So you can track your plaque over a time to make sure that whatever you're doing is actually working. Excellent. I just want to bring a little historical perspective.

Thank you for bringing up lifestyle. This is a reverse your heart disease naturally summit. People are hearing about nutrition a lot, fitness a lots, sleep a lost, stress management a lock.

even hyperbaric oxygen and vagal nerve stimulation and all kinds of interesting but science-backed approaches. Because I agree, the toolbox has gotten huge just in the pharmacologic area, but it's even enormous if you bring in lifestyle.

A lot of the listeners are very familiar with Dr. Dean Ornish and the Lifestyle Hard Trial 1990, Lancet 1998 in The Journal JAMA. And he took coronary angiograms on the intense lifestyle group and in control group.

and documented with quantitative coronary angiography that there was a reduction in stenosis. Now you've got a technology, you don't have to go through a heart cath.

You don' have spend $10,000 and be subject to a risk of bleeding or perforation or some other mishap, which as a cath cardiologist are real deals. It doesn't matter who you are or what your age, there's always a risks.

So you have replaced, maybe we should talk about for a minute. accuracy of cardiac catheterization versus accuracy and what you're doing because that is published data.

But when Dr. Ornish published that data, if you had to go back and think about it, do you think he was observing soft plaque being reversed through intense lifestyle?

Is there really any evidence you can drop calcification of coronary arteries? Not so much. What we've observed in the trials is that people can make their calcium denser.

So the difference between mud and a rock and coal and diamond, that goes in increasing density. And as that density goes up, the volume comes down. I don't know, and I think somebody should do the study, but if I had the hazard to guess, what he was observing was the transformation of plaque from sort of what's on a CT scan, it looks dark, that non-calcified plaque.

as it goes brighter and brighter, and transforms into calcium. And then if there were calcium, that the calcium would go into a denser calcium and that would be associated with an apparent reduction in volume.

But it was mostly driven by the transformation of plaque rather than regression per se. Okay. And just finally, a scenario, Bob, Barbara, somebody reckoned they're a little short of breath on exertion and they get a treadmill stress test.

And the treadmill, stress tests, this is a common scenario shows some changes that suggest, but do not prove that there could be coronary disease, coroner obstruction.

The doctor says you have an option. You can go through an invasive coronal angiogram, or we have at our imaging center. CT and geography with clearly analysis.

What's the database for those listening as to the accuracy of that important decision for a patient to consider? Or at least they may not hear it from their cardiologist, but now they're hearing it, it is an option.

Yeah, those stress tests, I think were tried and true when they were developed, right? So we've been doing stress testing since the 1970s. So if you think about as the world and technology has advanced, things have gotten better.

We know that at the time we were using it, they we're best in class, but the use of stress-testing to guide referral to an invasive procedure to look more closely at the arteries is associated with about two thirds of patients having no actionable disease.

So you can think about the statistics on that. If only one out of three people are actually diseased by after undergoing a stress test and being referred for an invasive procedure, it's probably not an ideal one.

It was very important to us that we would validate the diagnostic performance of what we were doing. So we picked six gold standards and all in multicenter clinical trials.

The first thing that we wanted to do was prove that against the expert readers, we were good. Against that phrase that you use, quantitative coronary angiography, which is the invasive catheterization procedure that many undergo each year.

And then a whole host of very advanced coronary imaging techniques, all invasive. So optical clearance tomography, intravascular ultrasound, fractional flow reserve, and then near field infrared spectroscopy.

The words aren't so important as much as it is that each one of those advanced imaging, invasive imaging catheters are aimed to try to detect a certain type of feature of heart disease.

And so no invasive catheter can do it all. We found that we were highly concordant with very high diagnostic accuracy against all of those things. So we wanted to demonstrate that you don't need an invasive evaluation, we can this in the non-invasive setting and we could provide six in one types of information that would otherwise need individual tests to do.

And I want to stress for the listener, because you may not appreciate what Dr. Minja said is not opinion. It's completed research studies published in the top journals where one would have to conclude other than the setting of you're in an emergency room or you are in extremis where an invasive catheterization is clearly often the best

approach.

If it's an outpatient elective setting, why not do it in the less expensive, safer, and possibly even more accurate way with the quantitation you offer?

It's a total paradigm shifter and the hospitals are going to fight it. Invasive cardiologists are gonna fight to some degree because a procedure is being taken out of their hands and being given off into the radiology department or some combined cardiology, radiology interpretive alignment, but so be it.

For those listening, coronary CT angiography with quantitation and AI is the cat's meow. Bring your cardiologists up to speed. Share this video with them because they'll find Dr.

Min in the National Library of Medicine 500 times and he is authority. Any final parting shots that you think are critical for the audience to hear? What's the website for CLEARLY?

Yep. So the website is www.clearlyhealth.com and clearly spelled with two E's. And I think the only parting thing that I would say, which I that many of the listeners may not know, and certainly we as cardiologists know but tend to forget or tend omit is that heart disease, like causing heart attacks and sudden coronary death.

is a silent killer in the majority of people. So just because you don't have any symptoms does not mean that you're not severely diseased. To your point about the hospitals and the invasive cardiologists, I think if our field shifted from a symptom-driven approach, like you have to have chest pain or shortness of breath for us to care about whether or not you'd have heart disease or no, and shift that symptom driven approach to a disease focused care paradigm.

I think that there's so many people that we can save and I net net, probably the invasive cardiologists are still going to see the same amount of patients coming through because there are so may asymptomatic people walking around in the United States that are ill but they just don't realize it because again, heart disease is a silent killer in a majority.

Strong work. A whole lot of invasive cardiologists like you again. Good job. Well, thank you so much. I think this is going to be just an all-star reception in terms of the information, the actionable information.

And people can go online and read about your software company and how it's transformed. medicine, how it's being used by cardiologists like me on a daily basis.

And I welcome it. Precision medicine for the number one killer of men and women in the Western world. What a powerful one-two punch. So thank you very much.

Thanks so much, Dr. Khan. It was a pleasure to be here. Thank you for tuning in to Doctor Talks. We hope today's episode has enlightened and inspired you on your path to optimal health.

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