Dr. Arthur Agatston	00:00:55	Okidoki. Well Ivor, we'll talk about what we do in the office every day. Somebody comes to us, often a family history of heart disease, sometimes they've been told of a positive calcium score, and/or maybe they've had a heart attack recently and wanted to prevention. So, our job is to find out what caused the heart attack, or the coronary calcium or the family history.
Ivor Cummins	00:01:24	Right.
Arthur	00:01:24	And so we use this as the basis. So we start with this conceptual approach first. Is it primarily a lifestyle problem? And that's always diabetes, pre diabetes, or what we call pre pre diabetes, or is it primarily genetic? And it can be both. And what we emphasize before is when we're talking about the lifestyle problems, you can have abnormal insulin secretion, a fatty liver, visceral obesity, the fat around your organs including in your pancreas, high triglycerides, low HDL, small LDL and HDL particles, which are atherogenic, high blood pressure, all this can happen before you have abnormal oral glucose tolerance, or an abnormal hemoglobin A1c. And that's what I learned from the Kraft Test and from you frankly, that all this happens, you know, early on.
Ivor	00:02:31	Early on exactly. And Arthur there, you have of course the metabolic syndrome components…
Arthur	00:02:35	Yes!
Ivor	00:02:36	… but they're not so decisive because it's kind of a syndrome. There's five of them, you can have three, but the Kraft Test cuts through all that.
Arthur	00:02:44	Absolutely. And we've been doing this again for the past year. We've always checked coronary calcium, the size of LDL HDL particles in our advanced genetic testing, which includes 9p21, Lp(a), we look for Familial Hypercholesterolemia, HDL dysfunction, small LDL, without the atherogenic lipid profile, which is kind of unusual.
	00:03:14	So these are people, usually people with small LDL, you assume have the atherogenic lipid profile. There are occasional patients we find who have that great example actually, who just is not insulin resistant, yet they have a small LDL. Meaning, we think it's still going to be atherogenic. It's not clear efficiently.

Ivor	00:03:34	Right? So you've got all of the insulin resistance, hyperinsulinemia on the right up there, and I'll show this chart after, and that accounts for a huge amount of our cardiac problem, calcification, etc. But on the left, we've got a series of genetic tendencies that are more rare than the average hyperinsulinemic heart victim, but they're all important because they're all individuals with a special cause, I guess you could say.
Arthur	00:04:00	Yes. And some are unknown. And if you don't have any of this, this is going to be the majority of patients. It can be mainly the genetic cause and then you have to treat that specifically. And more and more we're seeing combinations. And I have examples of that also.
Ivor	00:04:19	Great! I'm really looking forward to these patient stories or cases Arthur, but just one quick thing there as well. You know, the special causes, you've got a bunch listed there, but for people to realize that yes, a lot of it is hyper insulin and all those problems, the low carb community, for instance is fixated on high HDL, low dregs, fix insulin resistance, you're done. But there are all these things and there're also lupus, and even sickle cell disease, enormous calcification and heart disease in a person's teens. So it's important that people know there are loads of special causes. You can't be happy just because you're not insulin resistant.
Arthur	00:04:58	This is a representation in unknown causes. We have a patient who developed celiac disease from a lot of antibiotics that knocked out his microbiome. And he had a not very high calcium score and not really high risk, and all of a sudden he had typical angina. He would get angina when he had gluten.
	00:05:29	It was very interesting. It was actually documented. We would have a vasospasm on one of his coronary arteries when he had gluten. And so that's his mix of the microbiome and so much of its autoimmune including Type 1 diabetes. This is partial, and what it means is it's so important. There's so many things that working on type of LDL you have and that's mainly how long it's in the bloodstream. But so many things that affect that barrier between the bloodstream and the what I call the cholesterol pimple under the endothelium, and whether the LDL gets underneath. So it's partly, how long is the LDL related particle, whether it's VLDL or small LDL? How long is it in the bloodstream susceptible to oxidation, which makes it sort of sticky, and that's what causes the atherogenesis much more than the total volume. That includes HDL as well.

Ivor	00:06:46	Yeah. And you know, there are some people, actually quite a few lipidologist who are fixated on the number of particles. And that of course is part of it. If you've much more particles, you can have more resonance time and oxidation. Or you may have a huge number of particles and you have no problem at all, as I think you've seen with FH people in their 70s with zero calcium?
Arthur	00:07:08	Yes. Yeah.
Ivor	00:07:09	Wow! But a key unifying bad thing is when there's all these different causes under so hard to identify, in many cases, you really need coronary calcium to know if you're affected or not. And then if you are affected, even if you appear to be okay, you know, you got to keep digging. That's the key.
Arthur	00:07:26	Yes. And actually have family history is both sides. But it's not unusual for us to have a family where, say the father had a heart attack in his mid 40s where the wife, or the mother is… they are family, they've always lived in the 90s. So you have two sons whose genes that they get. Well, we've done this in their 30s, 40s. One, plenty of coronary calcium, the other clean as a whistle. One got the father's genes, the other got the mother's genes, and then we try to hone down and see what the target should be. So is it primarily lifestyle? Is it genetic cause, and the majority are lifestyle on this side.
Ivor	00:08:16	Yeah.
Arthur	00:08:16	But, you know, especially within a prevention practice, we see all of these. In fact, the case I'll show you are pretty much from the last month or so.
Ivor	00:08:29	I think earlier, even your example earlier, even on Lp(a), I'm just picking that one from the list. You can have people with huge Lp(a) with clean arteries in their 60s and 70s. Or you can have people with very significant disease where Lp(a) is the only significant thing they have as an elevated risk and everything else is fine. So yeah, it all comes back to the calcium again, have you got a big problem or not?
Arthur	00:08:56	Yeah.
Ivor	00:08:56	So these cases are going to be fascinating.
Arthur	00:08:59	Okidoki. So the first set, we're going to talk about what I call the pre prediabetes, because, you know, traditionally, you look at what usually the A1c, so if it's less than 5.7, 5.8, you're saying,

you're fine. Goodbye, good luck in most practices. What we've learned in the Kraft Test is no, there's risk, particularly for macro vascular disease, for heart attack and stroke and many other problems. Years and years before your glucose or hemoglobin A1c is high. Since we've been doing the Kraft Test for the past year, that's been such a game changer for us. And it's something we can really do something about. And so,

Ivor 00:09:51 Oh, and I think Arthur, as you mentioned on the phone a couple of weeks back, yeah, over the years, there were a lot of these guys who had A1c normal, they didn't have small dense LDL, you would assume they were non diabetic, but it's really the pulse glucose insulin, the Kraft Test that actually showed up what they got going on.

Arthur 00:10:10 Absolutely! Yeah, if you had time, I could show you 50. But we'll just do a few. I know you have to make a plan.

00:10:19 What we're talking about is people with normal oral glucose tolerance, normal A1c, less than 5.7, they often already have evidence of the fatty liver, they have visceral fat. When you're in the airport and you're looking around and you see these people with bellies, if they have fat there, they have fat in their liver is well, and they're going to have an abnormal Kraft Test. They have fatty pancreas, high triglycerides, low HDL, high blood pressure, small LDL, large VLDL, small HDL, and other factors as well.

Ivor 00:10:55 Or they may have some of those or all of them in rare cases or occasional ones. It's unclear because it's a syndrome, which some people show but some of these more than others. But ultimately, it's very hard to hide the insulin.

Arthur 00:11:11 Yes. Exactly, and you're absolutely right. And we see all those combinations and permutations in our practice. So the big thing well, is the cholesterol getting into your vessel, we know that from the calcium test, and is lifestyle really important, which we know from the Kraft Test. If those are all perfect, and we'll look at some examples, then we have to track down usually genetic causes. This is just a very conceptually very important slide. Because here is some of these fasting blood glucose over many, many years. And back here when the glucose is normal, if their insulin resistant, they have high insulin secretion, it's the higher insulin secretion, it's keeping the blood sugar normal. So they're not going to be positive by American Diabetes Association criteria with a high hemoglobin A1c until all the way here. And why did they become positive? It's because they can no longer

		make enough insulin to keep their blood sugar normal. It's fat in their pancreas that's limiting their beta cells. So the insulin goes down. That's when the fasting blood sugar goes up, and that's when they're diagnosed. But way back here, they have high triglycerides, low HDL, all those other what I'm calling pre prediabetes, for lack of a better term. It should have been called diabetes in situ.
Ivor	00:12:52	Yeah, it was a good term, like the carcinoma in situ, but pre prediabetes is very evocative too.
Arthur	00:12:59	Yeah. I'm not sure who told it. But the point is, is you have all these mechanisms going on years before your blood sugar is abnormal and you've macro vascular complications. And as Dr. Ralph defines, whose done probably more work in this area than anybody shows, is your association of insulin resistance to a post glucose load is continuous. So between normal glucose tolerance, impaired glucose tolerance, Type 2 diabetes, it's not strict cutoffs. It's all the same mechanism. And you can already be developing coronary disease, plaque as we see in patients when your glucose tolerance is normal by current classification.
Ivor	00:13:56	Yeah, for sure. And I think from Kraft's, 15,000 people or the 11,000 that failed with this diabetes in situ or pre prediabetes, 55% of those will pass a glucose tolerance test and 93% I think were passing fasting blood glucose.
Arthur	00:14:16	Yeah.
Ivor	00:14:16	So it shows you the enormous scale of the problem. How many unidentified people are being missed?
Arthur	00:14:21	Well, for your viewers out there, it's the majority of Americans will have an abnormal. Well, even my studies with prediabetes, it's 55%. And when you read the Kraft Test, you go up to 75, 80%. And again, look around the airport. Everybody with a belly will have an abnormal Kraft Test. So if you have a belly, no matter what your doctor says, make sure you get a calcium score and a Kraft Test.
Ivor	00:14:51	That's it. That's the pair.
Arthur	00:14:55	Now, just to show what's still happening out there, and we see this, this is a gentleman who went to see ahead of cardiac prevention at a major medical center. He had this belly. This is from a 3D fit machine we have, which actually gives you the display. This means to me, he's prediabetic, at least or pre

prediabetic, and they didn't do a calcium score or a Kraft. They did an A1c, it was 5.6. Normal. And he said, “Goodbye and good luck.” Turned out he had a calcium score, since when he actually joined our practice, was 1200. And by the way, he was homozygous for 9p21. That's a gene that facilitates the cholesterol getting into the vessel. Well, we don't know exactly how, it does not affect the size or the number of particles.

Ivor 00:16:03 Right? But the propensity for them to get in, infiltrate, [00:16:09] the whole process of atherosclerosis is accelerated for whatever reason with these people. Got you.

Arthur 00:16:14 Yes! Exactly. So this is from the CT, and this is around the heart, all this is excess fat. He's got quite a bit of fat under his skin as well. And this is his liver, here and here. His stomach, his spleen. This is all visceral fat.

Ivor 00:16:41 Ohhh. Yeah.

Arthur 00:16:42 So this is all dangerous fat. And here was his baseline lipids. That's why he said, “Goodbye and good luck.” He had a pretty high HDL, I don't know because maybe he was drinking. His triglycerides weren't all that high. His LDL was not all that high either. And so he said, “Goodbye and goodluck.” This is not unusual.

Ivor 00:17:08 And even his ratios are good, which are usually much more powerful indicators. So he's got a clean sweep there. The low LDL good ratios, high HDL, the whole lot, and that's August 18.

Arthur 00:17:21 So this is his Kraft Test. He goes up to, and for his age it’s unusual, insulin level of grave in 250. This is the 90 minutes and it stays very high at the full two hours. So he is really insulin resistant. It's taking a while for his beta cells to kick in. So yes, to me, that means he has fat in his pancreas as well. And you can tell from all the visceral fat, yet he's producing enough insulin that is A1c was still normal. I don't think for long, but…

Ivor 00:18:00 And his fasting blood sugar are presumably, which is always done, that was normal too. So just like David Bobbett, 900 score, massive diabetic dysfunction, a normal fasting blood sugar and a normal A1c, and three blocked arteries.

Arthur 00:18:30 The Kraft Test is so is so helpful. And in this case, the genes also. If he had developed this in recent years, he wouldn't have a score of 1200. So look at examples of that, because the insulin resistance is acquired, so your triglycerides go up, your HDL

goes down, the small particles may happen in your 40s, 50s You don't have as much time to develop plaque. But when you have something like the 9p21 homozygous, this exposure is from childhood. So you've had much more time to calcify your scar tissue and give you a higher score.

Ivor 00:19:20 Yeah.

Arthur 00:19:20 And so here is, he has chunks of calcium, this is his left anterior descending. This is going into a circumflex. And these are huge chunks right coronary also. So these have been around for a long time. So that's the combination of some insulin resistance, but also of this genetic exposure that he had.

Ivor 00:19:47 And something cursed me there, Arthur that when you see the picture, people might say, “Well, okay, it's kind of obvious. He probably is not in good health from his body shape.” However, there will be people with only a small stomach who has similarly good values high HDL, okay ratios, who could have just as much calcification risk without looking quite so pronounced. They might just have a small, normal, shall we say stomach in their 50s or 60s.

Arthur 00:20:13 That’s such an important point, and you know, Dr. Lustig makes the point that you're at high risk, [00:20:25] you have a belly. But if you just go for instance by the you know, BMI less than 30, you're not obese, the majority of the insulin resistance, the abnormal Kraft Test come from that group. And again, I do my airport research. You know, you see a few really obese people but for every obese person, you see a lot of people with bellies to my trained eye, who don’t consider themselves obese or even overweight, but they're clearly at risk.

Ivor 00:20:58 And if you bring in then the coronary genetic variants, you know different cultures, my buddy, Dr. Naiman in the West Coast, his Indian extraction people, as soon as they get like five or seven pounds, pop out a small little tummy, his words were, “Bam! They’re diabetic.” Now they won't fail a full diabetes test, they're diabetic in the test.

Arthur 00:21:19 I agree. And I think the next patient is going to demonstrate that.

Ivor 00:21:23 Excellent.

Arthur 00:21:24 Aha! Yes, a 57-year-old Asian extraction and pretty thin arms and legs. The Asian extraction with a belly and you see him, he

comes in a suit and you don't think he's particularly fat. This particular machine sort of really brings this out. He had originally have high triglycerides, HDL, not that low, here's his LDL, but he came at a country, everything was supposedly fine, and here's his Kraft Test delayed in high levels of insulin. He has very small LDL particles. This is the peak of his LDL and this is the small to medium, very, very high. And this liver, spleen, is visceral fat.

00:22:27 This is quite a bit of coronary calcium. But his primary problem was the pre prediabetes. His A1c, only 5.2 with this belly, that visceral fat and this coronary calcium. So you know, you miss his primary problem, unless you do the Kraft Test and the advanced blood testing So, just beginning on the diet is in his first month, triglycerides come down not properly, the HDL goes up, he was started on statin also. So the important thing of the statin was that it lowers his small LDL values as well as the large LDL, to small ones that you're really after a large LDL as not atherogenic.

Ivor 00:23:26 Quick favor to ask you, if you could put this video on pause for just a moment and go to ihda.ie. That's ihda.ei, and have a look at the homepage and scroll down to the share buttons and help us get the message out on the calcification scan and its ability to save the lives of many middle risk people who have no awareness that they've got major heart disease going on inside their body. So if you can do that first, we'll keep the podcast free.

Arthur 00:23:58 And the reason that small lines are not cleared efficiently, they become oxidized that makes them sticky.

Ivor 00:24:05 Yeah. And they don't fit the receptors and he has shaped the small dense. I remember reading a study once, the actual shape goes a little more descoital or a little kind of ovoid, yes, and then the receptor doesn't recognize so well as well. So you got a problem building up basically.

Arthur 00:24:21 Yeah. This is the oxidation. So any lipoprotein particle, it's not cleared efficiently whether it's normal size, and there aren't enough receptors as in most Familial Hypercholesterolemia, or people with HDL dysfunction. It's not a deformed particle, it's not enough receptors. But in other cases, it's the form particles, particularly in the prediabetes or pre prediabetes or diabetes.

Ivor 00:24:51 Exactly. And then to be honest, those particles will have to clear. I think it's the LOX-1 receptor on the endothelium, the

		wall of the artery. They will clear into the artery and contribute to challenges there.
Arthur	00:25:03	Yeah. Absolutely.
Ivor	00:25:04	So this guy, again, the candidate for statin, the CAC is almost 100, and recent studies have shown if you're 100 or above, you benefit greatly, perhaps low CAC not so much. So he's getting everything right. His lifestyle fixed, which is the big thing. And then he's lowering his particles. And how's he doing now, is he good?
Arthur	00:25:27	He came in just last week. He's doing very well and we'll have some good follow ups.
	00:25:37	Now the other thing, remember, on the last fellow I showed, crowler calcium score of 1200. He clearly had the lifestyle, but he had the genetic exposure from when he was young. So that's why he has a much higher level. But this exposure is relatively recent. We know it was about 10 years ago when he started to put on weight. He used to play a lot more tennis, he was a lot more active. And you can time, we have another case where we know where the patient's lifestyle deteriorating. Now, they will have relatively low calcium scores, but they can be progressing fast. And so that's where you sort of, “How fast the progression is?” We have people we’ve been following for every 30 years with very high calcium scores, but they don't have new particles, the process is stopped.
Ivor	00:26:39	They’re safe.
Arthur	00:26:41	Yes!
Ivor	00:26:41	Great!
Arthur	00:26:43	Okay, well, this is an interesting case. A 52-year-old who is from South American company. He moved up north several years ago. He's from South America. He sold his company, moved to Miami. He had had a calcium score in his early 40s. In South America, it was zero. And he came up and he had to beg his doctor to do another calcium score. And it was higher, it was 83. This was March of 2017, just more than a year ago, and he decided he better go on a diet and he lost 40 pounds. So this is him now and this is his Kraft Test. This was still a high level. It must have looked much worse when he was 40 pounds more, but this is still abnormal. He's still relatively high at two hours. And so, he lost 40 pounds.

	00:28:01	He had advanced blood testing. So his triglycerides in 2016 before he had that calcium score was 161 as he lost weight 117 and then down to 90. These were outside labs, it's actually lower now. His HDL went 45, 48 then up to 53. So this is his own lifestyle, his own low carbohydrate diet. The LDL, he was on a statin so that came down. And we actually have the particles. So here is his HDL, this is the next HDL, here it's 53. This is the one that we did last month. So the HDL which started at 45 is now 61 all from the weight loss, triglycerides down to 66. And that started 161. The total particle number was 15 all the way, came down to 707. His small LDL from 173 to 130, with the weight loss, which is essentially normal.
Ivor	00:29:23	Oh yeah. And the statin though of course contributing in this case.
Arthur	00:29:26	Yes, yes, in this case. He was only on a small dose. He was on five milligrams Rosuvastatin. So most of this was his lifestyle.
	00:29:39	He was under a lot of stress in the days when he wanted to sell his company and he had gained 40 pounds. He says namely all in the belly. He moves to Miami, essentially retires, which can be stressful in his case. He really relaxed, was able to lose the weight after he got the second calcium score. So we know these plaques are only about 10 years old, at most, maybe five years old or less.
Ivor	00:30:14	I think you're saying Arthur that, you know, the initial lesion problem, it's around a calendar year later, when the calcification commensurate with [00:30:23] begin to come in, approximately.
Arthur	00:30:24	Yes! Here's his left anterior descending artery. Here's a small plaque. Here's a larger one. This does not mean that this is more obstructive than this. It means it's had more years to calcify and get denser. And so the smaller and the less dense the lesions, the more recent they are and the more active the disease.
	00:30:54	So I showed you the fellow with a high 9p21 exposed since he was a child, because he was born with that gene. It was certainly exacerbated with his lifestyle. He was heavier from an early time. But here's a guy where he had a zero score. It's all his lifestyle, is pre prediabetes. And so we know these are all less than 10 years old. And we're happening from the time he had a zero score, and from the stress, the weight gain. But these

		are just as important even though they are a lower score, and the more dense. And what we find out, I'll show you later, people we've treated aggressively, these large particles become larger and denser, but you don't see the young particles. That's how you know you've controlled it. You can't just go by the score.
Ivor	00:32:01	And actually this is my cardiologist Dr. Ross in Australia. I remember I interviewed him. He said, "Yeah, certainly the volume comes down when you're successful and the younger lesions kind of regress. But the tendency is that the older ones that are calcified pretty generally stay there."
Arthur	00:32:21	I mean, I can tell you after looking at these, since 1988, the calcified plaques don't regress, when, if you just do the score, you may get a lower score. That's technical. And one of the first studies done by the Nashville Group, they said there was regression. It was actually regression to the mean, certain people were on statins, tended to have lower scores. But that was technical. When you look prospectively, you don't see calcified lesions disappear.
Ivor	00:33:03	And the interventions though, there is a question mark out there where regression has been seen in the score, apparently not just to the mean but real life like William Davis as we sat at a study of 45 people, and around 21 of them over three years actually lowered the score, even up to 40%. But I think the difference is he was using magnesium, vitamin D, fish oil, low carb and a mild statin and other interventions. His perception was only a massively multi factor intervention will actually potentially lead to the…
Arthur	00:33:41	Well, I mean, theoretically, you know, chelation might. But my experience and others who have worked with these for many years, have not seen it all. And also you may see something disappear. We now follow literally yearly . We're not recommending that for everybody, but we're looking for new lesions. The thing is, this guy, we know he went from zero to 83. And so he has all these young lesions that were active. Now he's lost the weight, everything's improving. I think these will all stabilize. But I'm going to repeat this study because it's now minimal cost. It's not a significant amount of radiation. This is a clear and present danger. Once I know there are no new lesions, the old ones next year, we'll see these get answer. We may miss one for technical problems, but when you have five years in a row, you know exactly what's happening with all these lesions. And you can really tell if somebody's progressing or not. It's my

score. Don't use the score for saying, “Oh, your score went down.” “Over many years, your score will go up less as [Paula 00:35:05] Raji has shown and others.”

Ivor 00:35:07 And that's really the key thing. It appears that from Raji Study, that really slowing the progression right down or dare we say it’s stopping progression entirely, that confers a risk reduction. That would be as good as reversing it because the stopping of progression seems to put people's risk back to as if you had a zero score in the first place or a low score.

Arthur 00:35:31 Absolutely. This is a 71-year-old who I have followed for many, many years. His calcium was 450 at age 54. We don't have to look at these but this is going back to thousand, and this is just we've been aggressive. So these are plaques that continue to get bigger. The plaque always starts at the beginning of the left anterior descending. And so these have gotten bigger and denser, his score has gone up. It's over actually over 1000 now. But where he didn't have lesions before; he's clean. This is the pattern you see, when you stop progression. You don't see any of those young lesions. And this is very important. Don't just say my score has gone up or gone down. You look at the old and the new side by side or even if I see the new, I don't see any of those young lesions like we saw in that guy who he put on the weight, he went from a zero score. We know the whole process was young. And so you don't see any plaques like this.

Ivor 00:36:53 Yeah. They're old, historical ones that have just settled down to this kind of sarcophagus, is what I sometimes call it. It’s just encapsulated in calcium. And you're not making new ones and you're not kind of aggravating older large ones or the edges of older larger ones. You've just stopped the disease process and then you’re risk plummets, as we’ve seen.

Arthur 00:37:16 Exactly. And now I follow people pretty much some from, you know, 1990. We have scores that went up from the low hundreds, which was very high, and maybe they're in the early 40s. They're much older now. They have high scores, they be treated aggressively, and they're fine. Now, without the treatment, they wouldn't be fine. It's a score, but it's the age of a lesion. So a virgin lesion who comes in and has never been treated, and they haven't lost weight or gain weight. You have to put that all together. So it's the calcium score, but it's the age of the overall process.

Ivor 00:38:07 Yeah. And these people who are okay, they started with a couple of hundred, maybe way, way back where they like the

Raji Study, they only rise around 10, 15% a year, and they can just keep steadily rising, and it's highly likely okay.

Arthur 00:38:23 So if you have a population of patients, you can follow the score and the population retreat will have less progression. And that's been shown.

00:38:35 Now, there's some controversy about you know, there's a statin, your course calcification, it causes faster healing, this from intravascular ultrasound and angioscopy studies where they watch the lesion over a year and someone's had a heart attack and has had a new plaque rupture and a new thrombus. So in the first few if they want to statin, he will heal faster. It's less inflammation, other factors. So that lesion will calcified fast, be faster, but over years, the progression depends on new calcifications, new plaque ruptures, new degenerated plaques, that you're growing new soft plaques. That's the way they start. So, in a population that's not treated, you've one new [00:39:30] faster overall calcification. But to see that, your score can vary depending on how the beans are hitting everything. So it's very good to look directly and have some experience.

Ivor 00:39:45 Yeah. And of course the series of scanning with a trained eye can really give you the comfort that new lesions are not being created and then you've arrived. Let the old ones just slowly help finish off calcifying, sit there.

Arthur 00:40:02 Right. I tell my patients because well, I might not going to have a heart attack, I said, "Well, I can tell you but you're going to see for yourself, you're not going to have new lesions. If you do, fire me and find somebody else who can stop it because I'm not doing the job I should." I haven't figured it out.

00:40:21 Now, this is a young guy only 43, TOFI, thin on the outside fat on the inside. Here's his belly, not very big at all. But this is his Kraft Test, at high insulin level, then coming back towards normal, very small particles, some excess visceral fat and you never say this guy… in fact, here's his skin, and here's the subcutaneous fat. He's thin on the outside but fat on the inside.

00:41:03 Now his baseline was horrible. And this is a fellow who I saw, he went to a doctor saying, "You don't need statins, you just need a low fat diet." And he came back. It was literally this last May after he had a heart attack. So that approach didn't work. And here, he had all this risk. Now he had high triglycerides, low HDL, you know, small particles. He had all this. And we had repeated his calcium score. This was a few years old, and he had

		a calcium score at age 40. Then when he was repeated at 43, he did have young clots/clocks [00:41:59] which show he continue to progress. And this was his initial LDL particle number off the wall, his small particle number 674, and small particles.
	00:42:18	So, here's one of the guys you see in the airport. Fine, he was at high risk. By the way, I'm sorry. He also was a 9p21 homozygous.
Ivor	00:42:29	Right. So again, you see that propensity susceptibility.
Arthur	00:42:33	Yes. Yeah, that wasn't a lifestyle alone. But he had the pre diabetes. His A1c, 5.1. Look at his triglycerides. I mean, he had the metabolic syndrome. He had a normal blood pressure but small particles, visceral fat, but no hypertension.
	00:43:05	Now, he's young so he still had some good beta cell function. So he was mainly identified by the high insulin levels and that's what you see in young people. They haven't had time to sort of destroy their…
Ivor	00:43:19	Yeah, so they got that big hump particular type pattern and then falls off quickly.
Arthur	00:43:26	Okay. Now, here is a 45-year-old, ohh, the one I should mention, you mentioned Asians, in Beijing, in Mumbai, they are approaching oral levels of diabetes, but not our levels, the western levels of obesity. The reason is that they tend to put their fat in their bellies and not subcutaneously. So the friend that you mentioned, where the belly pops out, that's because they don't tend to store fat under the skin, the same fat.
	00:44:05	So here's a great example. Thin arms, thin legs, and look at that belly. This is what we call, from this test they do the body shape rating, and this is horrible. This is ideal. This is as bad as you get. And you see that often more more commonly in Asians with less subcutaneous fat.
Ivor	00:44:34	And look at his Kraft Test, it's pretty low.
Arthur	00:44:37	Yes. Now he is diabetic, he's had A1c greater than 10, very non compliant. So I wanted to show what happened you know, once you're diabetic. The fat his producing, his beta cells are producing this much insulin. It means he's potentially reversible.
Ivor	00:44:58	Absolutely!

Arthur	00:44:58	It's not burned out.
Ivor	00:45:00	Yeah, that person could drop that A1c over 10 down to 5.8 maybe in a couple of months and have his insulin right back.
Arthur	00:45:08	Yes. We have a manifesting regimen now. And he's one where we go full keto with full fasting, because he's not always been so compliant, he disappears. And so we made a contract. And here is his very small, the peak of his LDL is a small particles, which is which he has all this calcium, because he's been sucking it in there for years.
Ivor	00:45:44	Yeah. What score has he got? Looks pretty high from the image.
Arthur	00:45:48	Yeah. His score, this is super high score. And we didn't find anything else on him.
Female	00:45:57	It says 3000.
Ivor	00:45:58	3000?
Arthur	00:46:01	3000 was his score?
Female	00:46:02	Yeah.
Ivor	00:46:04	Wow, it's big one. Well, we'll move on swiftly from that. That man hopefully looks well with the fasting.
Arthur	00:46:10	Yes, yes. Now, what's interesting, I didn't expect. Now, often with diabetics, they're no longer producing a high insulin level. It's just very delayed. He's very delayed, but he's still producing a high level.
Ivor	00:46:26	Oh yeah. And that's actually one of the fundamental mechanisms is is holding back the free fatty acids from your fat tissue. So that high insulin is holding back the torrent of free fatty acids that's going to drive gluconeogenesis and all the other mess, yet eventually the pancreas they keep going, it just gives up. The whole show collapses.
Arthur	00:47:23	So here's a 63-year-old white female who's an obese since childhood. And so she's coming to us as the magic diet, the doctor is going to make her thin. She has a zero calcium score, an A1c, 4.9, she has large LDL particles. And this was her shape rating. She actually has a thin waist. She has some visceral fat but not much. We haven't gotten... she's due for her Kraft test;

		she's just been reluctant. But she's been on a low carb, really ketogenic diet. She's staying on it. She's losing weight very, very slowly because she doesn't have the visceral fat to lose, but she feels so much better. She's staying on it. Her head's working better. Without the insulin resistant, it's interesting. But the thing is when I see somebody like this… by the way, her HDL, always good, not high triglycerides. And she did have a high triglycerides here, I have to take that back. But total cholesterol, 336, LDL 252, a zero calcium score, large particles, not small particles. And she's not… I often with these initial numbers they'd say FH, and we don't have her on a statin because she has a zero calcium score and she has large particles. So we presume she's clearing her LDL, but she has enough receptors in her liver.
Ivor	00:49:24	Or the prooxidant forces are relatively lower or whatever. But that's interesting, at 250 LDL and she is a form of hyper responder to the low carb diet looks like, pretty much.
Arthur	00:49:37	No, no, she's feeling well with low carb but not losing weight very slowly.
Ivor	00:49:42	All right, but her LDL response to low carb and getting healthy is is quite high, 252 for LDL alone. But as you say, a zero CAC. Looks like she has quite a history of high LDL as well?
Arthur	00:49:55	No, she has popped this up. Yeah. And no high LDL. She'd been over 300 in the past.
Ivor	00:50:05	So again one of those cases where super high LDL but no impact on the vascular disease, CAC is zero because the other things aren't going on there.
Arthur	00:50:17	Large particles that are presumably clear.
Ivor	00:50:19	Yeah, very good.
Arthur	00:50:22	Now, with the homozygous 9p21. This is just a 42-year-old, coronary calcium is present. He had a score of a few hundred. Here's calcium here, calcium here, and calcium here as well. Very little visceral fat and large particles, and abnormal Kraft Test.
	00:51:04	So, he's thin.
Ivor	00:51:07	The only thing is the homozygous 9p21? You can't see anything else there whatsoever, no?

Arthur	00:51:13	Nothing else that we can see. And we do have patients where this is the only thing. Ad again he doesn't have a belly, his triglycerides and HDL are good.
Ivor	00:51:32	Right! So that person may with that propensity or 9p21, they may calcify and drive disease over life. But if he keeps everything else good, they may actually not end up with a very rapid calcification.
Arthur	00:51:46	Well, that's one where the homozygous is affecting somehow the porousness of that endothelium. So this is a case where we're saying, fewer small LDL particles even though it doesn't have access, we're trying to decrease his LDL as much as possible. And we have had success. So when the endothelium is porous and we can't fix it, because it's hypertension or it's diabetes, then we're just trying to get the LDL as low as possible.
Ivor	00:52:20	Yeah. Because that is a detector that can be tackled.
Arthur	00:52:23	Yes!
Ivor	00:52:23	So it's a fair strategy. I think the problem today Arthur really is the LDL is almost exclusively the thing to be tackled, and all the rest is almost ignored. In your case, you've got everything right. But this patient, you know, it is a specific genetic thing, with an endothelium that may be you know, prone to leakage. And you're doing all you can do is you're tackling the LDL vector, which is absolutely fair enough.
	00:52:52	This person I wonder, even if you didn't do the LDL, I wonder what the progression rate might be with everything else good, except for the 9p21. Might they be a relatively steady solid progression? Not so much vulnerable plaque risk?
Arthur	00:53:07	Well I have experience and I showed you that first fellow. He was pre or pre prediabetic but had a score of 1200. So, again, if they have a high score when we see them, we assume they're progressive and we treat. Not everybody with 9p21 is high. Now the other thing is, is we go after the relatives, the brothers or the children. When do we do our first calcium score? You know, usually we wait until after age 40 and postmenopausally in women. But if there's a strong family history, and if we see risk, we do it earlier. So if the father had his first heart attack at age 45, the kids are in their 20s and 30s, and the father is a 9p21 homozygous, and he's had premature coronary disease, and we

		see one of the kids. Before we do the calcium score, if they're in their 20s, or 30s, we'll do the advanced blood testing, including the 9p21. If they're homozygous, we will do the calcium score much earlier than we otherwise would. And if we had plaque, then we start to treat them. And that's it. That's putting all this together.
Ivor	00:54:31	It's integrating calcium scoring with all of the knowledge of Kraft and/or special conditions as well, but is integrating everything. So every person counts, every individual gets the best preventative intervention. But Arthur, this is not happening in 99% of facilities, to be honest.
Arthur	00:54:52	This takes time. I showed you the fellow who actually saw the head of prevention. In medical centers, they don't have the time to learn, to sit and to think. It's a shame.
Ivor	00:55:09	It is a shame but okay, in your case and some other practitioners you're getting this excellent standard of care. But if it's simply not going to happen elsewhere, if we're realistic about it, then this kind of citizen scientists or people taking responsibility for their own healthcare will become really important. I mean, maybe with Skype conversations with really informed physicians like yourself, also doing their own research watching videos like this one perhaps, they will need to save themselves if the system is too busy to give them really individual care.
Arthur	00:55:47	That's the point of our new book, which I guess I will shamelessly say.
Ivor	00:55:54	A title yet?
Arthur	00:55:55	Yeah. It's "The Keto-Friendly South Beach Diet."
Ivor	00:56:00	Oh excellent! Because the original South Beach Diet, it's huge.
Arthur	00:56:03	Yes, yeah. I've 23 million total South Beach Diet books out there in the world. But we haven't done in many years. But the idea of this is give the book to your doctor. We see so many people are busy. Well, in the past week, few weeks, we had Bernie Sanders had a heart attack. And University of Miami, recently retired football coach had a heart attack. And as part of his physical, he never had the calcium score. I think he was certainly at the age where he should have had. This is all preventable. So people should have the Kraft Test. They're both simple and inexpensive.

	00:57:09	And by the way, here are the normal Kraft Test, this 42-year-old exercises regularly, is careful about his diet. He has a great lifestyle. But, he is at risk. But I don't have to hit him over the head. I'm certainly not going to say, “Have a low fat diet.” I mean, “Continue doing what you're doing. You have a normal Kraft Test and you have large LDL particles.” So this is the tailoring.
	00:57:40	HDL function is another issue that's often missed. Because we think, you know, HDL is the good cholesterol and it is. The reason it was found to be the good cholesterol is the first studies done in the United States. The large studies in the 80s and 90s. Most of low HDL were people with diabetes, pre diabetes or pre prediabetes. And so they tend to have low HDL. You go around the world and in Turkey and in small towns in Italy where they had the ApoE1 Milano, they have very low HDLs. They have no coronary disease. It's HDL function. But in this country, most of the low HDL is from insulin resistance, high insulin secretion, pre prediabetes or prediabetes. So that's why low HDL looks so bad and we say, “You have a high HDL, you’re safe.” HDL dysfunction is relatively rare, like all these compared to insulin resistance.
	00:58:51	And so here's your very high HDL. So this is a patient just from last week. HDLs in the 90s, calcium score of 165, A1c 4.8, normal Kraft Test, large particles. And in this particle distribution, what you see here is… there are different names for the large HDL. It's called HDL too, but the smaller HDL goes to the vessel wall. It picks up cholesterol from the vessel wall, or there's an ABCA1 receptor there. And when people with prediabetes, you see, that receptor is down regulated so the HDL doesn't work, and it doesn't get bigger from picking up that cholesterol. That's why with diabetes, you have low HDL; it's not carrying a lot of cholesterol. But once it picks it up, then it brings it back to the liver where the SR-B1 receptor clears it. It also can be cleared through a Cholesteryl Ester Transfer Protein to LDL and then through VLDL. And the drugs that were used to block that Cholesteryl Ester Transfer Protein didn’t clear it so it’s stuck around. The HDL wasn't clear, and it got oxidized and you know, they lost a lot of money from those drugs. It increase the HDL but not the HDL function.
Ivor	01:00:40	And actually I think, also in some of those CETP inhibitors, it lowered LDL and raised HDL and yet increased events. So yeah, that was the backfire.
Arthur	01:00:49	Yes.

Ivor	01:00:49	But here we've got high HDL levels on paper, but the functionality or efflux capacity is impaired.
Arthur	01:00:58	Yes. And the reason you can see this, with this Ion Mobility Test. So you know large particles, so it's not small particles and normal Kraft Tests. So it's not the lifestyle, but here we see what we call the the HDL pump. Because if the HDL is picking up the cholesterol and dumping it off in the liver, then the small and the large HDL are about the same. But if once you pick it up from the liver, you don't have SR-B1 receptors, just like the LDL receptor in Familial Hypercholesterolemia, if you don't have enough of them, you don't clear so it hangs around in the blood. You see a higher level, this is the HDL bump, and this is the HDL that gets oxidized, becomes like the velcro, sticks to the vessel wall. So even though it's not in abnormal size, it's not being cleared, it's getting oxidized, and it's causing the atherosclerosis.
Ivor	01:02:08	And a bit like Kraft patterns. Again, it's the pattern of the HDL and the dynamics that gives you the clue.
Arthur	01:02:16	Yes.
Ivor	01:02:17	Right.
Arthur	01:02:18	This is a thin patient, but we know it's all VHDL dysfunction,
Ivor	01:02:25	Right. Or at least predominantly, that's the special cause in it.
Arthur	01:02:29	Yes.
Ivor	01:02:29	That might again, we are relatively rare. I think there's a few versions of this HDL dysfunction. One of them is one in a couple of thousand people, but then there's some other ones. Suppose you add them all together, you know, you're occasionally going to see guys like this.
Arthur	01:02:48	It's uncommon, but not rare.
Ivor	01:02:50	Right.
Arthur	01:02:50	We have many. We have, you know, probably 10 families with this, and the patient is thin, athletic and their parents died at 50 of a heart attack. Specific case. Brothers already had a heart attacks or sisters. One patient, very horrible family history, the higher the HDL, the more the dysfunction, the bigger the

[01:03:18], it's not being cleared. So we have a woman with an HDL of 145. Loads of premature coronary disease in the family.

Ivor 01:03:29 And in her specific case, is she presenting yet, or... ?

Arthur 01:03:33 No. We get her LDL as low as possible, and there are some medications that uphill, upregulate SR-B1 receptors a bit. It was one that was taken off the market, should come back. It's a bit of a, I'd rather talk about it off camera. But that actually did prevent atherosclerosis in animals and it lowered HDL because it was helping the clearance of HDL. You know, the ApoA-1 Milano, from a town in Italy that they inject, it causes regression of atherosclerosis. Their total HDLs are 17 but the HDL is picking up the cholesterol dumping it off. It's like super hyper charts. There's never that much HDL in the bloodstream. It's being cleared so fast, but it's working super well. Yeah, rapidly getting out of the system, not getting oxidized. And the people who have the ApoA-1 Milano, they don't have coronary disease. That's how they chose it. They haven't been able to isolate it. They have isolated but not in a way yet that doesn't cause that side effects. I've been working on it.

Ivor 01:04:58 Yeah, Milano is out a long time and then it was disappointing trials because like you said, [the good nights late at the magic. 01:05:04]. But recently there's a claim, six or eight months ago, I think of a trial, I saw Milano pop up again, claiming a 30% reduction in events with a Milano variant being used in some trial, but I'm not sure. I just saw in Medscape headline somewhere.

Arthur 01:05:18 Oh, okay. I missed it. I'd love to see it. The first one, they made it from bacteria and it caused anaphylaxis in some patients. That's the one showed regression on intravascular ultrasound, but they couldn't use it because of the anaphylaxis.

Ivor 01:05:39 Collateral.

Arthur 01:05:40 So that's HDL dysfunction. Oh, here's the patient, no belly fat, normal. And here's her coronary calcification from the HDL dysfunction. And she actually has a particularly big liver. It's on both sides. It's a normal variant, but there's no visceral fat. No visceral fat, no fat here, and a normal Kraft Test. So, that's not her problem.

Ivor 01:06:13 68-year-old female, yet for female still looks like a substantial amount calcification. Not very high but…

Arthur	01:06:20	Not very (high.) In fact, she does not want to take statins, so she's one that we're following. We can see all of her lesions. So what we're saying is, you know, she may be going slowing up if she has more lesions then we're going to treat her.
Ivor	01:06:42	There's not much else she can do in the meantime. You're seeing no particular kind of trigger there?
Arthur	01:06:48	Right. If we see a new lesion, then we negotiate.
Ivor	01:06:53	Yeah. Okay.
Arthur	01:06:54	We're nice to some people who don't want statins. Now genetic, small LDL. So, here's a patient. Calcium score of 109. This is really high for a 46-year-old and he's got small LDL. So does he have prediabetes? Well, he's got a flat belly, exercise all the time. This is for years, basketball player who also does judo. He has ideal body shape index by our by magic scanner. Normal Kraft Test, no visceral fat, but he's got small particles. Now, we haven't found any as a family history of heart disease , premature heart disease. So this is what we found in him. We're getting his LDL and we're lowering a small LDL with a statin.
Ivor	01:08:04	Right. Oh no, you got to deal with the patient in front of you and whatever you can do and if the calcification is there and a 109, it's over 100 and a young patient, that is very, very significant disease and can benefit.