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Cardiac Troponin as a Marker of Heart Failure Risk in Diabetes

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Guest: Dr. Eric Kilpatrick from the Manchester Royal Infirmary, the Royal Manchester Children's Hospital, and Hull York Medical in the UK.

Bob Barrett: This is a podcast from *Clinical Chemistry*, sponsored by the Department of Laboratory Medicine at Boston Children's Hospital. I am Bob Barrett.

The number of people in the world developing diabetes is rising even faster than anticipated. This brings with it the risk of them developing the complications associated with the disease such as eye, kidney, and heart problems.

One of these heart problems is an increased chance of developing heart failure, a condition that unfortunately has the same five-year survival as the commonest cancers. Recent research has shown that cardiac troponin used to diagnose a heart attack can also be used to identify seemingly well patients who are at increased risk of developing heart failure in the future, whether they have diabetes or not.

The October 2022 issue of *Clinical Chemistry* published a paper where the investigators conclude that longer diabetes duration is strongly associated with subclinical myocardial injury. That paper from the Atherosclerosis Risk in Communities, or ARIC, study had an accompanying editorial on cardiac troponin as a marker of heart failure risk in diabetes.

The author of that editorial is Professor Eric Kilpatrick. He is a Consultant in Chemical Pathology at Manchester Royal Infirmary and the Royal Manchester Children's Hospital in the UK, and is also an Honorary Professor in Clinical Biochemistry at Hull York Medical. We are pleased to have Professor Kilpatrick as our guest in this podcast.

So first of all, we hear reports that the number of people developing diabetes is rising, but exactly how big a problem is this?

Eric Kilpatrick: Well, we've known for several decades about the rising prevalence of diabetes in developed countries, such as in North America or in Europe, but it seems that developing countries now are beginning to catch up rapidly. And that's mainly because their rates of obesity are increasing too.

And to give you an idea of numbers, the International Diabetes Federation estimates there are currently more than 500 million people in the world with diabetes. And even worse than that, they forecast that this will rise to nearly 800 million by 2045. So of course that's roughly twice the population of every single person in the United States and Canada. So, it really is a very big problem.

Bob Barrett: So what sort of problems might patients experience once they develop diabetes?

Eric Kilpatrick: If you're talking about the long-term problems associated with diabetes, there's two main sources. The first is called small vessels, small blood vessel complications of diabetes, the so-called microvascular complications, and they include things like retinopathy, which is diabetic eye disease, nephropathy, that's kidney disease, and neuropathy, which usually damages the longest nerve supply to the feet. So that's a small vessel complication.

There's also a large vessel complication as well called macrovascular disease. And these are the ones that make diabetes patients more prone to developing heart disease and strokes.

Bob Barrett: I understand there has been a recent focus of interest on heart failure in patients with diabetes. What is heart failure and what is its relevance to diabetes?

Eric Kilpatrick: Heart failure is where the heart has either become too stiff or too weak to pump blood properly around the body. And if you develop heart failure, it gives you symptoms of breathlessness, swollen ankles and legs, and a feeling of constant fatigue. The trouble with it is that it tends to get worse over time. And tragically, the five-year survival from that condition can be as bad as many of the commonest cancers.

And in respect to diabetes, and I just mentioned about diabetes patients being at an increased risk from heart disease, now, usually we associate that with being at an increased risk of a heart attack, a myocardial infarction, but they also seem to be at twice the risk of developing heart failure compared to someone without diabetes. And so it's only natural to want to find out why that might be the case and what, if anything, can be done about it.

Bob Barrett: Is there any way of knowing if someone is at risk of heart failure?

Eric Kilpatrick: Well, being at risk of heart failure is different from actually having it. When you know someone is at risk, it means you're able to predict that they're more likely to develop heart failure

in the future and hopefully then be able to do something about it, hopefully, because you've caught it early and you can do something.

Now, the main reason for this podcast is because the ARIC study investigators; ARIC stands for Atherosclerosis Risk in Communities study, a study that's based in poor American communities, they found that a blood test commonly used to diagnose heart attacks, or cardiac troponin, also seems to be able to predict the risk of someone developing heart failure. And that's whether they have diabetes or not.

So if you have a high level of this blood test called cardiac troponin, then you're more likely to develop heart failure in the future. But if you've got high level and you've got diabetes, then you're six times as likely to develop heart failure compared to someone without high level and without diabetes.

What this latest study in the *Clinical Chemistry* journal has shown is that the longer you have diabetes, the more likely this cardiac troponin test result is going to be abnormally high.

To give you an example, for someone with diabetes who has had diabetes for more than 15 years, they are at four to five times more likely to have a raised troponin result than someone who was diagnosed within say the last five years. And that in itself raises a tantalizing question, because if it increases the longer you have diabetes, can you do something to stop it rising over time? And if you can, will that reduce the person's risk of developing heart failure?

Bob Barrett: So finally, doctor, what can be done to reduce someone's risk of developing diabetes complications? And do these methods apply to patients at risk of heart failure?

Eric Kilpatrick: Well, just talking about diabetes in general, nothing to do with heart failure, generally speaking, we want to make sure as much as possible that a patient with diabetes has excellent control of their blood glucose, excellent control of their blood pressure, and excellent control of their blood cholesterol through both medication and lifestyle measures. Because we know that if each of these are as good as they can get, that reduces the likelihood of both those micro and macrovascular complications ever developing.

And you also asked about heart failure. Well, we hope that taking these sort of measures might also be helpful in reducing the likelihood of heart failure as well, although at this stage it's still an act of faith. What I do know is that amongst the dozens of diabetes treatments used to lower

blood glucose, there are some that also seem to work in treating heart failure, whether the person has diabetes or not.

So you can therefore imagine a situation where we might end up using a cardiac troponin test to identify those patients with diabetes who should receive this medication in preference to all the others available, and hopefully help them avoid developing heart disease and heart failure later on in their lives with diabetes.

Bob Barrett: That was Professor Eric Kilpatrick, a Consultant in Chemical Pathology at Manchester Royal Infirmary and the Royal Manchester Children's Hospital in the UK. He has been our guest in this podcast on Cardiac Troponin as a Marker of Heart Failure Risk in Diabetes. His editorial, as well as an original scientific paper examining data from the Atherosclerosis Risk in Communities study, appear in the October 2022 issue of *Clinical Chemistry*.

I'm Bob Barrett. Thanks for listening.