



Health Column – February 2008

There's a New Way to "Look" at Coronary Artery Disease

The old way of looking at coronary arteries

Coronary artery disease remains the leading killer in this country, accounting for almost one-half of all deaths among American adults. To detect coronary artery disease, cardiologists have traditionally taken X-ray pictures of the arteries and looked visually for blockages caused by cholesterol build-up. But we have known for years that some patients – for example, those who smoke or have very unhealthy diets - can have heart attacks before there is very much cholesterol build-up in their arteries. In other patients, by the time there is visible cholesterol build-up it may be too late to help.

And the new way...

In the spring of 2002, my team at Penn State College of Medicine carefully threaded a hair-thin sonar camera into the heart of a young woman with a malfunctioning heart transplant, but no visible cholesterol build-up, to study the effect of dietary changes on the speed and resistance to blood flow through her coronary arteries. The results of that research, published in 2007, added to a growing body of evidence that rather than being just passive tubes through which blood flows into the heart, coronary arteries are actually living tissues that need to shrink, expand and change their flow characteristics in response to environmental conditions. These observations have led to a whole new way of looking at coronary artery disease. For example, we now understand that the first thing to go wrong in the hearts of patients destined to die of a heart attack is that their coronary arteries lose the ability to expand normally when the heart muscle needs more oxygen-carrying blood. This impairment, which can cause breathlessness or chest discomfort during exercise as a result of the heart muscle not receiving enough oxygen, is now known to be common in patients who have diabetes or are overweight. Cigarette smoke (including second-hand smoke) and fatty foods cause coronary arteries to immediately lose this ability to expand. Over time, this impairment can become permanent and leads to the development of cholesterol build-up, coronary blockages and heart attacks. On the other hand, sugar does not appear to impair coronary artery function much at all, while anti-oxidant vitamins (like vitamin C in fruits and vegetables, and phenols in dark chocolate) may actually increase blood flow through your coronary arteries by making them more pliable and expansive. Cardiologists now recognize that, to serve our patients best, we sometimes need to know more about their coronary arteries than can be learned by just taking X-ray pictures. This recognition has led to the development over the past decade of a number of clever miniaturized cameras, radar guns, and blood pressure monitors small enough to be inserted into the coronary arteries to measure their size, shape, blood flow velocity and other characteristics

How can your cardiologist use this new technology?

The revolution in miniaturized blood flow technology has fundamentally changed the way physicians and hospitals evaluate coronary artery disease. Now, cardiologists working in modern cardiac catheterization laboratories will often insert a tiny blood pressure monitor into a partially blocked coronary artery to help them decide whether the blockage is severe enough to warrant fixing it with balloon angioplasty and stenting. After a metal stent has been inserted into a coronary artery to correct a blockage, the cardiologist will frequently inspect the stent inside the artery with a tiny ultrasound camera to make sure it is properly expanded. In patients with chest pain or breathlessness who are found to have early cholesterol build-up, researchers may use a miniature ultrasound “radar gun” to test whether the coronary artery has lost the ability to expand normally – a problem known to greatly increase the chance of having a heart attack. Perhaps most importantly, research done with coronary blood flow technology has led us to a better understanding of the link between healthy dietary choices and heart health. So on Valentine’s Day, as you pop that dark chocolate orange-cream bonbon into your mouth, you may want to reflect on the technology that has taught us that although the cream may reduce the flow of life-giving blood through your coronary arteries, the dark chocolate and orange may actually improve it!

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