MORE THAN A TEST

THE STRESS TEST IS AN ESSENTIAL TOOL TO ASSESS ISCHAEMIC HEART DISEASE

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The question how to look for heart vessel blockage and the reply given by Dr YML in Star Health (Sunday 10th April 2011) highlight the misconception patients and doctors have that blockages have to be looked for and opened in an attempt to protect against heart attack and death . When a patient wants to know what the risk is of death or heart attack, he asks about the degree of vessel blockage. In actual fact, heart vessel blockage is a part of aging and degree of blockage is not an accurate predictor of the likelihood for total obstruction, heart attack or death (1,2).

Studying the vessels of the heart, by inserting a tube all the way to the heart (coronary angiogram) or while doing a CT scan (CT angiogram) reveals information about the structure of the vessel. It does not tell us how well that vessel carries blood to the heart muscle and whether the flow is sufficient to meet the varying needs of the heart muscle with varying patient activity. Think of the water pipe carrying water to a tap in a house built a decade ago. We do not ask whether the water pipe is narrowed, as it surely must be if the house was built some years ago. Rather we always ask whether there is sufficient water coming from the tap, for drinking, for washing and other purposes. For the human patient, it is the treadmill stress test that provides information on the adequacy of blood flow to the heart muscle. Using the tap analogy, with a treadmill stress test we are turning on the tap fully to see if sufficient water flows. Only is there is insufficient water flow from the tap will we try to find out where the water pipe blockages are and then fix them.

The classical time a stress test is performed is when a patient is unsure about the cause of his chest pain. From the ECG recording and from how the patient feels (symptoms) during the stress test, the doctor can objectively decide whether it is inadequate blood flow to the heart that is the cause of his problems (3). If inadequate blood flow to the heart is shown, then a study of the structure of the blood vessel (coronary or CT angiogram) can be done with the aim to subsequently open the obstructions. So the stress test should be the first test to be performed, and if it is abnormal, then tests to look at structural blockage (coronary or CT angiogram) can follow.

Since heart muscle functions normally only when it gets adequate blood flow, it is also important to know the condition of the heart muscle. The echocardiogram reveals information about the function of the heart muscle. If it functions well, it is likely that the patient's future outlook (prognosis) is good. If a part of the muscle does not function as well as the others, then it is likely that the blood vessel supplying that part of the muscle has serious obstruction (4). If the heart muscle is weak overall, then there is an urgency to treat the obstructions, if the obstructions are felt to be the cause of this weakness. In fact, heart muscle strength has been proven to be more important than number of narrowed vessels in predicting future outcome of a patient (5). One can even combine the stress test with the echocardiogram to see if abnormal blood flow to the heart muscle can be induced with exercise, since inadequate blood flow not present at rest can be shown up when the muscle is strained by extra workload (6).

It is now clear that the degree of obstruction does not predict future potential of a heart attack. Studies have shown that the 30% obstruction is more likely to cause a heart attack by becoming a total obstruction than a narrowing of 70% (1,2). Thus, knowing the degree of narrowing of the blood vessel of the heart at present does not tell us when the vessel will obstruct totally. Consider the analogy with accidents and type of road. Fatal accidents often occur on wide highways, when drivers travelling fast face an unexpected small incursion on the road. On narrow village streets, traffic is slow, but because drivers are careful, fatal accidents seldom occur. So in the narrowed blood vessel, the major narrowing seldom ruptures to cause a heart attack, while the minor block can rupture unexpectedly leading to a heart attack that can cause death.

The treadmill stress test can a reliable guide to the future well being of a patient and so can be performed in a patient with no symptoms to determine prognosis (7). If insufficient blood flow is only demonstrated when the patient performs a heavy workload on the treadmill stress test, the patient's future risk is low, prognosis is good and there may be no need to consider operation or other procedures to open up any narrowed vessel. A chart developed at Duke University Medical Centre accurately predicts a person's yearly risk of death from the duration of exercise, the discomfort felt and the changes in the ECG (8).

It is incorrect to assume that bypass-surgery or opening a block will benefit all patients with heart vessel obstruction and automatically reduce future adverse outcome. Recent trials such as COURAGE and BARI-2D have shown that compared to taking medication alone, opening obstructions by stenting or surgery does not reduce heart attack or prevent death in most patients with stable coronary artery disease (9,10). Thus looking for obstruction with the hope to open or bypass them is not the way to treat this disease. Opening or bypassing obstruction is only done when the obstructions are causing pain or are an immediate threat to life. Over the medium term, obstructed vessels can open up from drugs, or even with lifestyle changes (11,12).

A patient should first do a stress test to find out if he is in the high risk category or if chest pain is due to heart vessel obstruction. If there are obstructions, but risk for future serious event is not high and pain only comes at heavy workload, then drug treatment and lifestyle changes are needed with no necessity to look for structural obstruction with coronary or CT angiography. After all, even after opening or bypassing vessel obstructions, lifelong drug treatment and lifestyle change will be necessary. Doing a CT angiogram to show heart vessel obstruction can alert the well patient that he is at risk for future adverse outcomes (13). However, what treatment to offer and whether there is a need to open the obstruction depends on the effect of the obstruction, revealed by the treadmill stress test and echocardiogram. There is significant radiation exposure from angiographic study, and all treatment whether with drugs, stenting or bypass surgery is not free of side effects and risk of harm. Thus, any decision on investigative test and treatment option should be carefully thought over and discussed between patient, family and doctor, remembering the limitations and consequence at every stage.

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