Utility of CT Scan to Detect Coronary Artery Disease

Besides thorough history, physical examination and electrocardiogram, doctors do stress testing to diagnose coronary artery disease. Regular stress testing entails monitoring the electrical activity of the heart. Nuclear stress testing, also monitors the electrical activity and evaluates heart muscle function as also stress echocardiogram.

These 2 later tests are better than regular stress test, but they're not perfect. Stress tests only detect if a person has one or more severely narrowed coronary arteries (that is more than 70% blockage),that restrict blood flow, triggering symptoms,and/or abnormal finding during the test.

There are two other test available, which would accurately detect presence or absence of coronary heart disease. Invasive coronary angiography has been used for more than half a century. This involves passing a slender tube called catheter through a leg or arm artery up to the heart and injecting a dye and visualize the arteries on a x-ray.

Even though it is rare, occasionally serious complications can occur, including bleeding at the catheter insertion site or damage to the artery. On the other hand, cardiac CT angiography (CCTA) which was developed nearly 25 years ago, is non-invasive. During this test, a dye is injected into a vein in the arm or hand.

Instead of standard x-ray, used in invasive coronary angiography, this test uses a CT scanner, which take multiple rapid x-rays that are merged together to create a detailed three dimensional view of the heart's arteries. While the preparation and set up may take up to an hour, the actual scan lasts less than a minute.

Now we know that most heart attacks are caused by not from serious blockages, but when smaller non-obstructive plaques rupture and form a clot that triggers a heart attack. CCTA reveals both obstructive and non-obstructive plaques. CCTA may may help cardiologists find and treat heart disease sooner.

CCTA has class 1 indication, and an “A” level of evidence-that means the strongest possible recommendation for use as a first line tool to evaluate people with chest discomfort or those coming to the emergency room with chest pain. Most of the people seen in the emergency room, have non-cardiac disease, meaning their chest pain is not related to the heart.

So CCTA can be helpful to rule out a possible heart attack.

As a part of CCTA test, you will also get calcium score. The amount of calcium in the arteries, otherwise called plaque burden is calculated by a computer and provides a score. A calcium score of zero means you don’t have significant plaque.

Score of one to 100 indicates mild coronary artery disease, 100 to 400 is moderate coronary artery disease and more than 400 is severe coronary artery disease. When the risk is higher than expected, it helps to direct the person towards appropriate medication’s, such as statins and lifestyle modifications.

Even though, hard, calcified plaques are less likely to rupture and cause a heart attack than the soft “ vulnerable” plaques, Calcium scoring proves to be an accurate way of gauging the total burden of atherosclerosis. The presence of hard Plaques suggest that you may have Plaques throughout your cardiovascular system.

A follow up CCTA may be performed to determine whether the plaque poses a significant obstruction to blood flow. Recently, there is more improvement in CCTA technique. If the significance of a plaque is uncertain, a sophisticated technique known as FRACTIONAL FLOW RESERVE (FFR) maybe applied to calculate the amount of blood flow through the blocked artery.

CT-FFR helps to determine whether a lesion is severe enough to require interventions , such as stenting. Previously, this FFR test was available only during invasive coronary arteriography. However, CT-FFR is not available in many of the hospitals.

SOME CAUTION ABOUT CCTA: There is a lot of excitement about use of CCTA. But the benefits depends heavily on the quality of the image and not all scanners are the same. There are some in individuals who are not good candidates for CTTA.

These include people with high heart rate that can't be effectively lowered with medication and also people who are obese with the body mass index of more than 40. Both these conditions can limit the image quality. People who have allergy to the dye should avoid this test.

People with known coronary artery disease, maybe less likely to benefit from CCTA because the results might not change how they are being treated. However, in future, as the technology improves, repeat scanning might help physicians to see how well specific treatment is working and if adjustments are needed .

If you have chest pain or other symptoms suggesting heart disease and the result of CCTA test is negative, meaning you don't have significant plaque, we can confidently say that the symptoms are not those of a heart attack, and we need to look elsewhere for answers. If you have mild disease, risk factor modification to prevent disease progression should be done.

On the other hand, if someone has extensive disease, the patient would need an invasive cardiac catheterization in preparation for interventions like stenting or bypass surgery

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