

Utility of dual-source computed tomography for myocardial perfusion assessment (ULYSSES).

Coronary heart disease (CHD) or ischemic heart disease accounts for 1/5 of deaths in the world. The mechanism of this disease involves the impaired myocardial blood flow caused by the narrowing (stenosis) by an atherosclerotic plaque (deposit) of vessel which supply the heart (the so-called coronary vessel/artery). Impaired blood flow causes an inadequate supply of nutrients and oxygen to the demands heart muscle which is described as ischemia and is a pathophysiological substrate of both stable CHD and myocardial infarctions. The ischemia usually develops first when the demand of the heart muscle for oxygen and nutrients is increased: in situations of physical exertion or emotional stress which corresponds well with the clinical picture of CHD which is formed by occasional chest pains during physical or emotional exertion. Some patients do not develop the symptoms of CHD despite having the impaired blood supply to the heart muscle- this situation which is called "silent ischemia"- very dangerous- as it is now recognized as a cause of sudden heart death as a result of arrhythmia. Myocardial infarction- a state in which heart muscle ischemia is exacerbated to the point of causing rapid death of heart muscle cells- may also be the first and potentially fatal symptom of coronary heart disease.

Modern cardiology offers a causal treatment of CHD through minimally invasive percutaneous cardiac procedures. Such treatments usually involve the introduction of metal scaffolds (called stents) via punctured peripheral vessels into the coronary artery in order to widen the vessel and unblock the flow of blood nourishing cardiac muscle. The decision to place a stent into the coronary vessels depends mainly on the grade of the narrowing. If such a narrowing is greater than 70% it is generally considered that it causes ischemia of the heart muscle and therefore requires placement of the stent. Narrowings which are smaller (i.e. intermediate) (50% -70%) necessitate widening only if they cause significant ischemia or in other words are functionally significant. For many years the evaluation of anatomical picture of CHD was possible only using invasive procedures such as coronary angiography. As an additional step the evaluation of significance of the stenosis was often required using either invasive (requiring the introduction of a catheter into the coronary artery) or non-invasive (using one of imaging tests such as magnetic resonance imaging- MRI or a test based on the decay of radioactive isotopes – SPECT).

The latest non-invasive method of assessing CHD is cardiac computed tomography (CT) which was originally used only to assess the diseased heart vessels anatomy. The recent years proved that the long standing dream of cardiologists which was the ability to non-invasively assess both the anatomy and the function of diseased heart vessels (ischemia) in a single study thanks to the development of CT technology today may actually come true. Technological progress has resulted in the excellent technical parameters of CT scanners- the results of the evaluation of myocardial ischemia can be accessed in one study with anatomical evaluation- much faster than with other methods, and additionally as we presume safely (with low-doses of radiation and contrast agent) and efficiently (its value should be similar to the results of older diagnostic methods). ULYSSES study is designed to check whether those predictions are correct. Moreover, the use of the most advanced tools we have may provide new data on the phenomenon of myocardial ischemia as such. ULYSSES study as a basic research study may help to find a way for CT-based evaluation of ischemia to Ithaca of the future clinical application studies.