Computed Tomography Coronary Angiography (CTCA) and its Non-invasive Role in Stable Coronary Artery Disease

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Coronary artery disease (CAD) is a pathological process characterized by atherosclerotic plaque accumulation in the epicardial arteries, whether obstructive or non-obstructive. This process can be modified by lifestyle adjustments, pharmacological therapies, and invasive interventions designed to achieve disease stabilization or regression. The dynamic nature of the CAD process results in various clinical presentations, which can be conveniently categorized as either acute coronary syndromes (ACS) or chronic coronary syndromes (CCS). CTCA uses computed tomography (CT) scanning to take images (angiograms) of the coronary arteries. It requires the use of rapid CT scanning techniques and can only be carried out in centers where the equipment is suitable and the medical/technology staffs are trained appropriately.

Computed Tomography Coronary Angiography is the preferred test in patients with a lower range of clinical likelihood of CAD, no previous diagnosis of CAD, and characteristics associated with a high likelihood of good image quality. It detects subclinical coronary atherosclerosis but can also accurately rule out both anatomically and functionally significant CAD. Its higher accuracy values of CTCA when low clinical likelihood populations are subjected to examination [1]. Trials evaluating outcomes after coronary CTA to date have mostly included patients with a low clinical likelihood [2,3].

The non-invasive functional tests for ischaemia typically have better rule-in power. In outcome trials, functional imaging tests have been associated with fewer referrals for downstream ICA compared with a strategy relying on anatomical imaging [4,5]. Functional evaluation of ischaemia (either non-invasive or invasive) is required in most patients before revascularization decisions can be made. Therefore, non-invasive functional testing has now come to be preferred in patients at the higher end of the range of clinical likelihood if revascularization is likely or the patient has previously diagnosed CAD.

If CAD is suspected in patients, but who have a very low clinical likelihood (≤ 5%) of CAD, should have other cardiac causes of chest pain excluded and their cardiovascular risk factors adjusted, based on a risk-score assessment. In patients with repeated, unprovoked attacks of anginal symptoms mainly at rest, vasospastic angina should be considered, diagnosed, and treated appropriately

In addition to diagnostic accuracy and clinical likelihood, the selection of a non-invasive test depends on other patient characteristics, local expertise, and the availability of tests. Some diagnostic tests may perform better in some patients than others. For example, irregular heart rate and the presence of extensive coronary calcification are associated with increased likelihood of non-diagnostic image quality of CTCA and it is not recommended in such patients [1]. Stress echocardiography or SPECT perfusion imaging can be combined with

dynamic exercise testing, and may be preferred if additional information available from the exercise test, such as exercise tolerance or heart rate response to exercise, is considered important. Exercise ECG cannot be used for diagnostic purposes in the presence of ECG abnormalities that prevent the evaluation of ischaemia. Risks related to different diagnostic tests need to be weighed against the benefits to the individual [6]. For example, exposure to ionizing radiation associated with CTCA and nuclear perfusion imaging needs to be taken into account, especially in young individuals [6]. Similarly, contraindications to pharmacological stressors and contrast agents (iodine-based contrast agents and gadolinium-based chelates) need to be taken into account. When testing is used appropriately, the clinical benefit from accurate diagnosis and therapy exceeds the projected risks of testing itself.

European Society of Cardiology (ESC)'s chronic coronary syndrome guideline revised the role of CTCA in CCS is to first line considered non-invasive investigation in 2019 updated guideline. This recommendation is based on Diagnostic performance of computed tomography coronary angiography (from the Prospective National Multicenter Multivendor EVASCAN Study, SCOT- HEART Registry, Coronary CT Angiography Evaluation for Clinical Outcomes: An International Multicenter Registry) CONFRIM Registry and Prospective Multicenter Imaging Study for Evaluation of Chest Pain - PROMISE Trial. If obstructive CAD cannot be excluded based on clinical evaluation alone, either non-invasive functional imaging or anatomical imaging using CTCA may be used as the initial test to rule-out or establish the diagnosis of CCS [1-3]. These all results of the registries and trials have provided valuable information about the usefulness of CCTA that is recommended to use as a first-line considered non-invasive tool in our clinical practice in Chronic Coronary Syndrome.

Conflict of Interest

None to declare.

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