

EDITORIAL

Is calcium the key for the assessment of progression/regression of coronary artery disease?

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Coronary calcium scoring has become a common test for cardiovascular risk stratification

Coronary artery calcifications are part of the atherosclerotic degeneration of the arterial vessel wall. Since the introduction of electron-beam computer tomography (EBCT) and the Agaston score,¹ coronary calcium has been investigated for several years and has become a common test for cardiovascular risk stratification in several countries.² However, it is not yet accepted within primary prevention guidelines.

The method is simple and was developed to assess the coronary artery burden of calcium. By means of a non-contrast-enhanced EBCT (or more recently multislice computer tomography (MSCT)) scan, we can quantify the amount of calcium in the coronary tree.

Coronary calcium score obtained with EBCT is equivalent to the one obtained with MSCT.^{3–5} Several studies demonstrated a fair correlation between EBCT and spiral-CT/MSCT. In addition, the reproducibility of MSCT (5–12%) is better than EBCT (14%–51%), depending on scan technique and quantification method.^{5–8}

In this issue of the journal, Houslay *et al*⁹ report a substudy from the SALTIRE trial. They investigated, in 102 patients with aortic valve calcifications, the rate of progression of coronary calcifications for a median period of two years, randomising the patients to treatment with 80 mg of atorvastatin versus placebo. The randomised, controlled study concludes that lipid-lowering drugs do not affect significantly the progression of coronary calcifications.

We know that coronary artery calcifications derive from an active metabolic process similar to that taking place within bone tissue.^{10–12} If coronary calcium is the result of the precipitation of calcium, then it may only represent a marker for atherosclerosis. As an active metabolic process, instead, it may become a unique marker of progression/regression of coronary artery disease.

CONCEPTS INHERENT TO CORONARY CALCIUM IMAGING

The interest of the scientific community in coronary calcium is based on the concept that calcium may be an early and/or more specific marker of coronary atherosclerosis and an indicator of future coronary events. Calcification in coronary artery vessel walls is a

very sensitive marker for the presence of atherosclerosis^{13 14} and shows moderate correlation between its extent and the likelihood of coronary obstruction.^{15 16}

Calcification starts very early in the atherosclerotic process and progresses with the volumetric increase of plaque burden.¹⁷ The macroscopic calcified spot (that is, the minimum amount of calcium that can be visualised by EBCT or MSCT) appears in relatively advanced stages of coronary artery disease.^{17 18} This is the basis of the controversy over whether calcium, as detected by EBCT/MSCT, can be considered an early marker of coronary atherosclerosis.¹⁸

Serial studies have demonstrated that it is possible to induce the regression of coronary stenosis with lipid-lowering drugs and that a small reduction of the degree of stenosis corresponds to a considerable reduction of coronary events.^{19 20} Thus, atherosclerotic plaque stabilisation is independent of the recovery of lumen patency. Given the fact that coronary calcium undergoes an active metabolic process, authors reported some time ago that the administration of lipid-lowering drugs in asymptomatic individuals reduced significantly the progression of coronary calcification.^{21–23}

STUDY LIMITATIONS

The scanner technology employed in the study is not the most up to date, and neither is the scoring method—the latest 16/64 slice MSCT scanners may offer more reliable and reproducible quantification of coronary calcium. However, we should consider the calcium score as a simple method for risk stratification, and therefore not necessarily subject to rapid development.

In addition, even though the Agaston score is the reference standard for coronary calcium score, newer and more reliable methods are available (volume and mass).²⁴ These methods are able to reduce further the room for error and improve reproducibility, therefore allowing a better detection of smaller changes in the score, especially in the set-up of serial studies.

The population, although followed up for two years, is rather small compared to other observational studies.

NEW CONCEPTS IN CORONARY RISK ASSESSMENT

Since 2001, MSCT was able to display a promising capability in detecting not only coronary calcium but also the non-calcific component of

Abbreviations: MSCT, multislice computer tomography; EBCT, electron-beam computer tomography

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plaques.²⁵ These results were improved with the latest generations of MSCT scanners.^{25–29}

It is expected that MSCT will prove to be useful in the assessment of total coronary plaque burden.³⁰ However, only qualitative and semi-quantitative information have been reported until now. Software developments are required as well as further MSCT scanner improvements (that is, beyond 64 slice) in order to achieve the detection of the so called “vulnerable plaque”.

Calcium score alone, as measured by EBCT/MSCT, does not have the capability of assessing the distribution of various morphologic patterns of calcium and their relation to other “soft” plaque components. While MSCT coronary angiography may extend the potential of non-invasive plaque imaging, several limitations are still present. The most important limitation, in terms of serial coronary plaque burden assessment, is radiation exposure.^{31 32}

CONCLUSION

The study of Houslay *et al*⁹ adds new information to the controversy surrounding the usefulness of calcium scoring for serial evaluation of coronary artery disease progression/regression. An important public health message can be drawn from this study. In some regions of the world patients are subjected to repeated CT scanning to determine if their calcification score is increasing. Given the controversial evidence, this may be a questionable medical practice exposing patients (actually asymptomatic individuals) to unnecessary radiation exposure.

The recent introduction of MSCT coronary angiography has brought high expectations in the evaluation of total coronary plaque burden. However, the value of the parameters that can be measured using this technology has yet to be demonstrated.

Conflict of interest statement: I have no conflicts of interest

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