What comes before coronary artery disease? Defining atheroma burden

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Recent advances in several technologies, such as CT imaging and intravascular ultrasound, allow evaluation of atheroma build up in the coronary arteries. The ability to provide images showing the extent of plaque formation within the coronary arteries before disorder of function is new to the management of coronary artery disease and perhaps consideration of new terminology is now required.

Key points

- **New technologies allow visualisation of coronary atheroma.**
- **Not all coronary atheroma will necessarily be high risk or cause a problem.**
- **Describing atheroma burden as coronary disease before symptoms or loss of function may not always be most appropriate.**
- **Defining atheroma burden may allow intervention to prevent development of disease.**

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Historically, coronary artery disease has been defined by the presence of symptoms, including angina, shortness of breath and acute coronary syndromes. This is because previously there has not been a means to evaluate the presence of plaque within the arteries of a well person until it impairs normal functioning with signs and symptoms or it is a 'disease state'.

Recent years have seen the development in several technologies, such as cardiac CT imaging, intravascular ultrasound, intracoronary optical coherence tomography and magnetic resonance imaging, that allow evaluation of atheroma build up in the coronary arteries. Cardiac CT technology has become the most widespread and accessible.

Cardiac CT imaging can be performed without contrast (coronary calcium scan [CCS]) or with contrast (computed coronary tomography angiography [CCTA]). A detailed description of CCS and CCTA is beyond the scope of this article (for further details see: 'Coronary calcium scan and CT angiography: chalk and cheese' published in the September 2011 issue of *Cardiology Today*).[1] The importance of CCS and CCTA lie in their ability to provide images that evaluate plaque within the coronary arteries before a disorder of function or symptom. This is a situation that is new to the management of coronary artery disease and one that perhaps requires consideration of new terminology.

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Why should we use the term atheroma burden?

In case 12 of the case study article in the September 2014 issue of *Cardiology Today*, the situation of finding plaque formation on cardiac CT imaging in a patient who presented in a primary prevention capacity (risk stratification) and had not had an event nor any symptom is presented.[2] This is someone who is otherwise healthy and was subsequently told he has coronary artery disease. In this situation, the term coronary artery disease may not be the most appropriate terminology to describe the situation. The patient felt and is well, and although he has plaque in his arteries, there is no disorder of function or symptom. A term that can be used for this situation is 'atheroma burden'. Reasons why we should use this term are discussed in more detail below.

There is not yet a disease

The patient described above has not yet had any event or symptom so the term 'disease' is not well received by the patient. It is much easier to have the conversation about 'a build up of cholesterol in the arteries that needs risk modification', rather than label the patient with a disease. There is a significant psychological cost in diagnosing a disease, particularly in a patient such as this who has presented in a primary prevention capacity feeling well. This type of patient is healthy and our objective is to keep them that way. This is the Holy Grail of preventive cardiology: to avoid the disease. Not using the term 'disease' requires the treating clinician to convey appropriately the risk of an event the patient may carry. There is no value in using more palatable terminology at the expense of complacency in management.

It can describe a spectrum

Atheroma burden is a term that allows interpretation along a spectrum of both the amount of atheroma and clinical setting. Compare two 60-year-old asymptomatic men, the first with a CCS score of 1 and the second with a CCS score of 1000. The first man has low-risk atheroma burden, whereas the second man has high-risk atheroma burden. They each require different management, so to label both men as having coronary disease fails to recognise the significant differences.

Compare an asymptomatic 70-year-old man with a CCS score of 50 and an asymptomatic 40-year-old woman with a CCS score of 50. They both have an equivalent amount of plaque burden based on the same score. In absolute terms the score is not particularly high and would likely carry a low risk of a cardiovascular event over the next 10 years.[3] For the 70-year-old man, this is a mild or low-risk atheroma burden for his age and sex[4,5] (below the 50th percentile) and unlikely to imply a significant change in the interpretation of risk from the CCS score alone. For the woman this is very high atheroma burden compared with an age- and sex-matched population[4,5](greater than 90th percentile) and is likely to imply a significant change in the interpretation of the risk from the CCS score alone. It is a 'concerning atheroma burden' or 'potentially high-risk atheroma burden' and likely to represent a significant increase in lifetime risk of a cardiovascular event for this individual.[4,5]

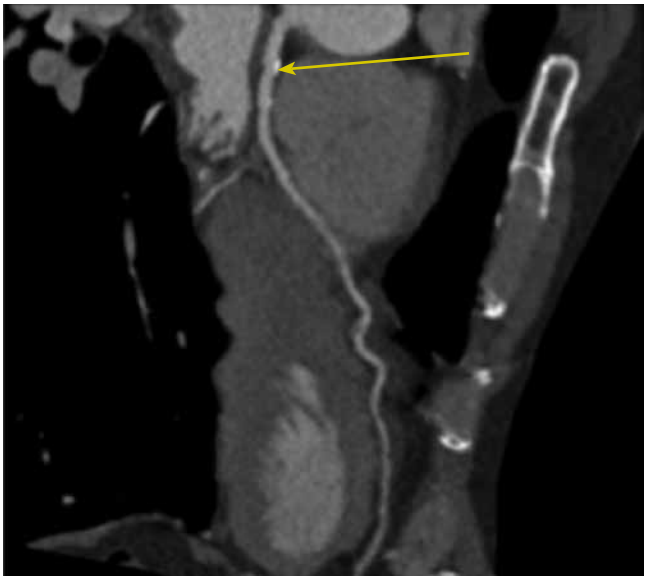

Figure. Computed coronary tomography angiography image of a coronary artery demonstrating proximal calcific plaque (arrow).

It is part of the ageing process

Lastly, development of atheroma in the coronary arteries appears part of the ageing process, such that if we were all to live long enough, we would all have evidence of wear and tear, or atheroma. The fact that this occurs more rapidly in some and more slowly in others simply reflects a different predisposition and not more or less aggressive disease, at least in the early stages, unless we wish to call the ageing process a disease. The term 'atheroma burden' allows description of a process that can progress at different rates in different individuals, as one might see in a patient with early joint degenerative change who does not yet have arthritic disease.

By recognising that the development of atheroma burden may be part of an ageing process, such that everyone will develop some, to some degree, with individual variation, creates the possibility that a change to terminology could improve the handling of patients such as the one described in case study 12.[2] This becomes important in the setting of life insurance or licensing as a pilot or commercial vehicle driver. High-risk atheroma burden or low-risk atheroma burden is a more valuable descriptor in this context compared with presence of plaque and therefore coronary artery disease.

Further discussion with case examples

A case example may help to illustrate the above. A 55-year-old man who is a commercial pilot presents with atypical chest pain and at low to intermediate risk of cardiovascular disease based on the results of a cardiovascular risk calculator. He undertakes cardiac CT imaging and his CCS score is 30 (see Figure). This shows low-risk atheroma burden for his age and sex (below the 50th percentile), without significant noncalcific plaque volume, remodelling or stenosis, features that have been observed to be linked to increasing risk. This is consistent with the predication from the cardiovascular risk

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calculator. If this patient were to have his pilot license threatened or have an increase in his health insurance premium because the presence of coronary calcium means he has been labelled as having coronary artery disease, then this misses the point because his cardiovascular disease risk is less than 5% over the next five years based just on the CCS score alone.[3] Of course other risk factors have to be considered to make a comprehensive clinical risk assessment. In this case, however, the features from imaging support the risk calculation from the cardiovascular risk calculator. Using the term 'coronary artery disease' seems not only inaccurate and clumsy but also detrimental to understanding the process.

Conversely, if we can take a healthy patient, who may have a high-risk atheroma burden, and reduce their risk of a cardiovascular event through appropriate intervention, then this would be good for everyone. In this setting, appropriate risk modification could avert an event or the disease. (Could it even justify reduced insurance premiums?)

Atheroma burden can allow a spectrum of significance and can be dealt with far more effectively than if we take a well patient and simply label them with a disease. A changing technology has changed the way we can evaluate the build up of cholesterol in the arteries. It would seem reasonable that we explore how terminology may need to move forward to fit with these changes.

A move towards using the term atheroma burden in clinical practice

Coronary atheroma burden may be defined as the extent of plaque formation in the coronary arteries as demonstrated on imaging before the development of disease. Coronary atheroma burden is not a new term, existing in the imaging lexicon, but it is perhaps time for it to become part of the clinical vernacular.

A move towards the use of the term 'coronary atheroma burden' in clinical practice requires description of potential risk-related features demonstrated on imaging. For cardiac CT imaging, this would include features such as the absolute CCS score, CCS percentile, plaque features including composition, remodelling, stenosis and location, described in a way to acknowledge the potential risk that the atheroma burden may represent. **CT**

References

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