

Toward early diagnosis of coronary artery atherosclerosis



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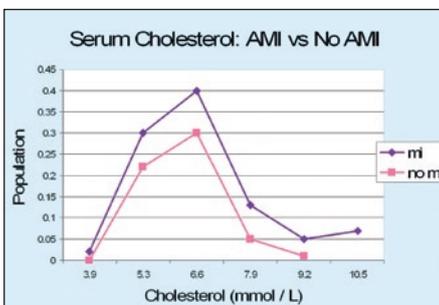
上医医未病之病 *"Inferior doctors treat the full blown disease.*
 中医医将病之病 *Mediocre doctors treat disease before it is evident.*
 下医医已病之病 *Superior doctors prevent disease."*
 ~黄帝内经~ Nai-Ching, 2600BC; first Chinese medical text



65000 people per year in Australia have a heart attack. For 50% their first symptom of coronary artery disease (CAD) is their heart attack – 25% die within an hour of their first ever symptom and for 7.5% their first symptom is their last symptom (www.heartfoundation.com). Coronary artery CT moves the physician one step closer to the goals of 2600BC. There is now a means to move toward the treatment of disease before it is clinically evident.

Risk Assessment: Why not just use standard risk factors?

Risk factors are population based. Unfortunately, significant overlap exists between those who have a coronary event and those who don't (see Pic 1). For patients concerned more about their individual risk, it is better to define whether they have the disease rather than have a risk of the disease?



■ Pic 1: Overlap of total cholesterol in those with prior myocardial infarction (AMI) and those without infarction. This data does not really help to predict individual risk.

Why not just do a stress test?

CAD begins as non-calcified (soft) plaques in the wall of a coronary artery. It causes the coronary wall to bulge outwards, and only encroaches into the lumen late in the disease course. For an asymptomatic patient, it makes little sense to select a stress test (designed to diagnose luminal lesions) when it is a test of intramural atherosclerosis that is needed.

A better way to diagnose CAD early

There is now extensive data that suggests Coronary CT is likely to fulfil this role.

It allows differentiation of those with intermediate risk factors, into groups with actual high risk (who would benefit from

targeted medical intervention) versus those actually at low risk. Targeted aggressive non-procedural treatment aims to prevent events that may happen years later. Due to time lag, outcomes data is still forthcoming.

Coronary CT consists of two entities, often combined in a single sitting - the calcium score and the coronary CT angiogram.

CT calcium score

This test's prognostic value has been found to be independent of and incremental to risk calculators such as the Framingham model. As the amount of calcium in coronary arteries increases, so does the risk of a coronary event. Any calcium doubles the relative risk. A score of greater than 400 increase the relative risk by 25 times (Arad JACC 2005). For perspective, a hypertensive dyslipidaemic patient has a 3.5 times increased relative risk (NZ Risk calculator). If you have calcium in the coronary arteries, you have coronary atherosclerosis. By contrast, the standard "risk factors" are only markers of possible disease.

CT coronary angiography

A zero calcium score does not mean the patient is free of atherosclerosis. The disease begins as 'soft plaque' in the arterial wall and with time, may calcify. It is these soft plaques, when they rupture, that account for the majority of heart attacks. Studies show that in the intermediate risk population, 16% with zero calcium will have soft plaque (Hausleiter JACC 2006).

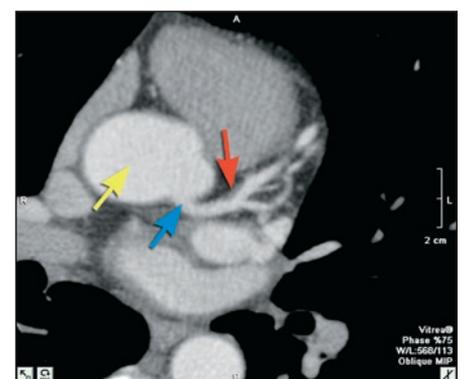
In a 10 second breath-hold, the 64slice CT scanner can diagnose soft plaque. Using IV contrast injected into a peripheral vein, the coronary artery lumen and vessel wall are made visible. Thus, soft plaques can be identified (see Pic 2), risk further stratified, and therapy better targeted.

Recommendations for scanning of asymptomatic patients

- Intermediate risk patients– all should have a CT scan.
- Low risk patients – only if strong family history or sibling with CAD.
- High risk patients – only to reinforce treatment or to motivate.
- Stress tests – all normal (because lesions are luminal late) or equivocal, if indications for stress test remain
- Other indications include: Rule out anomalous origin of the coronary arteries; CABG patients with atypical symptoms; and atypical chest pain to rule out coronary artery disease.

There is no Medicare rebate available for coronary CT. SKG provides this service only by doctor referral.

The CT angiogram is greater than 90% sensitive and has a similarly high specificity (JACC 2005). There can be a small error in quantitation of vessel stenosis; however, a normal test is normal.



■ Pic 2: CT Coronary Angiogram: 59-year-old asymptomatic male, showing the aortic route (yellow arrow), left main coronary artery (blue) and proximal left anterior descending (LAD) coronary artery. There is a large soft plaque (red arrow) bulging from LAD vessel wall. Most heart attacks occur due to the rupture of these plaques.