Detection of myocardial infarction by CT angiography

To the editor: In the study looking at cardiac CT angiography (CTA) using perfusion scintigraphy as the reference standard,[1] cardiac CTA had a sensitivity of 75%, specificity of 98%, positive predictive value of 68%, and negative predictive value of 99%. The authors concluded that cardiac CTA had a moderate sensitivity, a moderate positive predictive value, high specificity and a high negative predictive value.

What is wrong with this picture?

At the extremes of prevalence, predictive values are profoundly affected. In this case, disease prevalence was 20/366 (5%). With this prevalence, just about any test is going to have a high negative predictive value. A clearer way to represent their data would be to report, at a minimum, the normalised predictive values where the disease prevalence is set to 50%.

The clinical implications of normalising predictive values are obvious by looking at contingency tables of their original data (table 1), and comparing this with a 50% prevalence normalised contingency table (table 2). The sensitivity and specificity of the test are not affected by a change in prevalence. However, the normalised positive predictive value is 97% (up from 68%) and the normalised negative predictive value is 80% (down from 99%).

This normalisation is important. It allows a meaningful interpretation of predictive values, and enables a comparison of predictive values from various research studies and across different imaging modalities.

The clinical implication of their research? Cardiac CTA, when positive in a normalised population, is highly meaningful and almost always represents true disease. A negative cardiac CTA is reassuring, but should not be relied upon exclusively to rule out such a serious condition.

Table 1 Disease prevalence of 5%

	MI positive	MI negative
CTA positive	15	7
CTA negative	5	339
Total	20	346

Sensitivity = 75%; specificity = 98%; positive predictive value = 68%; negative predictive value = 99%.
CTA, CT angiography; MI, myocardial infarction.

Table 2 Disease prevalence of 50%

	MI Positive	MI Negative
CTA positive	137	4
CTA negative	46	179
Total	183	183

Sensitivity = 75%; specificity = 98%; positive predictive value = 97%; negative predictive value = 80%.
CTA, CT angiography; MI, myocardial infarction.

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The authors' reply: We thank Dr Heston for his interest in our paper.[1] We are encouraged that Dr Heston found our results to have clinical significance and we agree with his conclusion that the positive predictive value in our paper was meaningful, especially given the low prevalence of myocardial infarctions.

Dr Heston correctly points out that disease prevalence can impact predictive values. Thus in populations with high or low prevalence of disease (as in our paper) reporting predictive values alone can be misleading. We therefore dealt with many of Dr Heston's comments in our discussion, though we did not report normalised predictive values.

In 2003, the Standards for Reporting of Diagnostic Accuracy (STARD) steering group published standards for studies of diagnostic accuracy such as ours.[2] In it they included a checklist of 25 items that journal editors should require, but did not require normalised predictive values.

To date it has been uncommon for studies to report normalised predictive values. For example, most coronary CT studies reporting performance characteristics of multislice CT angiography for diagnosing coronary stenosis were conducted in populations with a high prevalence of coronary artery disease.[3] Perhaps in future publications the STARD steering group or others may specifically require such reporting.

In sum, we join Dr Heston in encouraging readers of scientific publications to be mindful of the limitations of reporting positive and negative predictive values alone.

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Mechanisms of angina

To the editor: Angina is traditionally thought to be "ischaemic" in origin with increasing demands for blood in the myocardium giving rise to visceral pain. Prolonged ischaemia leads to myocardial infarction. The prognosis for each condition may depend on their varying aetiologies.[1] Recent studies demonstrate aberrant myocardial reinnervation in ventricular arrhythmias, cardiomyopathies and after myocardial infarction; in some circumstances periarteriolar reinnervation takes place.[2]

Concentric layers of periarteriolar nerves occur in uterine smooth muscle causing sustained, visceral pain in the week before menstruation.[3] These lesions often accompany widespread aberrant reinnervation in specific areas of uterine muscle, specifically the uterine isthmus where primary neurovascular bundles enter the viscus. Sources of injury include persistent straining during defecation and traumatic injuries sustained in childbirth.[3 4]

Few gynaecologists are familiar with the morphology of the inferior hypogastric and uterovaginal plexi.[5] Widespread use of formalin to preserve cadavers for medical education in the post-war years, selectively destroys fine, autonomic nerves.[5] However, both uterine and cardiac ganglia were familiar to 19th century anatomists dissecting fresh cadaveric material.[6] Does periarteriolar reinnervation, or, aberrant myocardial reinnervation, account for some forms of angina or acute myocardial infarction, and their varying prognoses?

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