The use of multislice computed tomography angiography (CTA) for the diagnosis of coronary artery disease

Key points
- Multislice (or multi-detector) CTA is less invasive and less time consuming for diagnosing coronary heart disease compared with coronary x-ray angiography (CA), the ‘gold standard’.
- To date, technical issues have meant that multislice CTA (2–16 slice scanners) cannot completely replace CA; rather it has had a complementary role. Further technical advances and future generation CT scanners (eg 64-slice scanners) may alter this.
- The papers identified do not provide information regarding the cost effectiveness of CTA.
- Further research is required to fully understand the clinical and cost effectiveness of 64-slice CT scanners for the purposes of angiography.

Epidemiology
Coronary heart disease is one of the leading causes of death in Scotland, accounting for 11,441 deaths in 2003. If coronary heart disease is diagnosed, the outcomes can be managed in a variety of ways. Multislice CTA can be used to visualise narrowing of the coronary arteries and diagnose coronary heart disease.

Health technology description
Multislice CT scanners have multiple rows of detectors, enabling a large number of thin image slices (ranging from 2 to 64) to be obtained simultaneously. They provide important diagnostic information in a faster, more patient-friendly manner than conventional CA. Sixty-four slice scanners received US FDA clearance in 2004 and are CE marked for marketing in the EU. Early adopters are already using multislice CT for cardiovascular imaging.

Multislice CTA is assuming the role of gatekeeper to the cardiac catheterisation laboratory for certain patient populations and indications, such as ruling out atherosclerosis. CA is still necessary in some cases to confirm multislice CTA results since CA has a higher spatial and temporal resolution. Multislice CTA is one of a number of less-invasive diagnostic tests currently available which can determine whether or not patients would benefit from CA (other examples are electron beam computed tomography and magnetic resonance angiography). The potential use of multislice CT scanners is extensive and not restricted to coronary angiography.

Safety
Multislice CTA is safer than CA as it is less invasive and does not have the risks associated with arterial catheterisation. Like CA, it requires potentially harmful iodinated contrast agents to be injected, although the amount of material required is 25% less for CTA. However, multislice CTA exposes the patient to three times more radiation than CA. A recent paper recommends dose-reducing technical improvements. Claustrophobia is a problem for some patients.

Clinical effectiveness
An assessment in 2001 found that neither 4-slice nor 16-slice CT scanners have been shown to be comparable with conventional CA in terms of diagnostic accuracy in detecting stenosis. However, the authors noted that in the absence of a full systematic review it is difficult to draw definitive conclusions. One review highlights a number of studies, the largest of which was conducted in 91 patients in 2003 and reported that multislice CTA (4-slice) identified 82% of stenoses detected by CA. It was concluded that multislice CTA is acceptable for identifying coronary artery stenoses. The authors predict that as CT technology advances with the introduction of 64-slice systems, diagnostic cardiac catheterisation procedures will decrease, but therapeutic catheterisation procedures could increase as better diagnostic tests reveal cardiovascular disease earlier and in more patients. Most current CT systems are limited in their ability to accommodate heart rates ≥100 beats per minute and irregular rhythms.

Economic implications
A 64-slice scanner is expected to cost more than £1,000,000. In addition to this, the cost of software for cardiovascular imaging and annual service costs will have to be considered. Training and practice would be required to develop the skills necessary to convert raw information from a CT scanner to optimal diagnostic images. Thus, if the current paucity of clinical evidence is indicative of the 64-slice scanner being used in a complementary role, a cash investment would be required and no cash savings would be expected.

If future research supports the use of a 64-slice scanner as a replacement for CA, there is the potential for cost reductions arising from a reduction in cardiologists’ time and the decrease in the contrast material used per scan. Furthermore, it has been noted that the cost of the multislice CTA procedure amounts to less than half that of conventional CA.

Whether the equipment cost could be offset by increased patient throughput and these expected cost reductions, as speculated, remains to be seen. However, the potential for increased patient throughput could have a positive impact on waiting lists.

To date there are no economic evaluations available to support such speculation or allow conclusions to be drawn about the cost-effectiveness of 64-slice CTA.

This document is intended to direct NHSScotland planners to existing key evidence, which may be supportive to their decision making, rather than to provide a comprehensive overview of all the existing evidence. Evidence Notes are not designed to make specific recommendations to NHSScotland.
References

1 www.isdscotland.org
   http://pcpoh.bham.ac.uk/publichealth/horizon/PDF_files/2001reports/Imaging.pdf

Further reading

  www.ccohta.ca/publications/pdf/211_ct_scanning_cetap_e.pdf
  www.impactscan.org/mstcdose.htm
  www.impactscan.org/reports/Report05012.htm

Useful contact

- ImPACT, a CT scanner evaluation centre exists which provides services to the NHS in the UK. Visit www.impactscan.org for comparisons of CT scanners.

Further information

- For further information about the Evidence Note process, see www.nhshealthquality.org or email evidencenotes@nhshealthquality.org.
- To propose a topic for an Evidence Note, email evidencenotes@nhshealthquality.org.
- References can be accessed via the Internet, using the addresses provided, via the e-Library (www.elib.scot.nhs.uk), or by contacting your local library and information service.

© NHS Quality Improvement Scotland 2005

NHS Quality Improvement Scotland consents to the photocopying, electronic reproduction by 'uploading' or 'downloading' from the website, retransmission, or other copying of this Evidence Note in NHSScotland for educational and not for profit purposes. No reproduction by or for commercial organisations is permitted without the express written permission of NHS Quality Improvement Scotland.