Coronary artery imaging using MDCT and MRA

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The potential benefits provided by new imaging technologies for the diagnostic evaluation of CAD are quantified by considering the expense, time, and associated risk of possible complications of traditional invasive angiography. Two techniques currently being used in clinical practice are magnetic resonance angiography (MRA) and computed tomography angiography (CTA). MRA and CTA are particularly disadvantaged in comparison to tradition angiography because of their poorer temporal and spatial resolutions. They each possess their own strengths and weaknesses and as the technologies continue to develop the diagnostic accuracy and the clinical value of these tools are further studied. The end goal is to have a fast, non-invasive technique to efficiently screen and diagnose patients with symptoms of CAD.

The study by Liu et al in the March issue of the Journal of Geriatric Cardiology has provided an insightful comparison between 16-slice multi-detector spiral computed tomography (MDCT) and breath hold 3D magnetic resonance (MR) coronary angiography. In this comparative study of 40 patients with suspected CAD, 31 patients underwent coronary MRA and MDCT and a follow-up conventional angiography. The authors demonstrate that MDCT has a higher sensitivity than MR for the detection of significant coronary stenosis (83% vs. 63%), whereas MR has a higher specificity than MDCT (90% vs. 84%). Both MDCT and MR have high negative predictive values which could make them useful for excluding coronary stenosis in symptomatic patients.

While these results seem encouraging, the authors point out that there are a number of shortcomings in each procedure. MDCT is very good at sensing calcium plaques, but this very often led to a false positive result meaning significant stenosis (over 50%) was detected when in fact there was much smaller vascular lesions. In fact, this accounts for the higher false positive rates in computed tomography versus magnetic resonance seen in a number of studies. MR on the other hand was plagued with poorer resolution and the inability to clearly visualize more segments than MDCT. This was attributable mostly to motion error. Hence, there is a greater limit in the ability to render adequately readable film with MR versus CT. In comparing practical usefulness, MRA scanning was a much longer process taking an average of 23 minutes. MDCT, however, took an average of only 11.5 seconds. MRA on the other hand does not require the use of contrast media which is more preferable in patients with renal disease.

What does this mean for clinicians? Well, neither MDCT nor MRA should be considered for diagnostic protocol yet as there clearly is still much room for improvement in accuracy and dependability. Newer generation CT and MR devices are already out on the market and with future studies maybe they can be validated to be used as a widely implemented diagnostic procedure. Nonetheless, both MDCT and MRA could be potentially useful for ruling out significant coronary artery disease given the high negative predictive values for each test. As already mentioned MRA is more limited in its use because of the poorer image quality in a larger number of visualized vessel segments. On the other hand, given the extreme rapidity with which MDCT can be done makes it a great choice for ruling out coronary stenosis in an acutely symptomatic patient. This could easily be used as a precursor in the decision to proceed with a more invasive procedure.

Reference