

CORONARY ARTERY DISEASE

A new method to produce high-quality 3D images using available X-ray data

Standard angiography uses two-dimensional (2D) projection imaging, and is limited by a reliance on the expertise of the operator to acquire multiple views of the suspected area and mentally fuse the 2D images into 3D images. CT and MRI-based 3D imaging have been proposed as alternative approaches to the visualization of regions of suspected disease, but Anne Neubauer and colleagues believe that a more cost-effective alternative for visualization of the coronary tree would be to generate high-quality 3D information from X-ray data. To do so, they have combined the use of rotational angiography with subsequent automated 3D reconstruction. The former uses a programmed C-arm to acquire multiple views of the coronary tree and, therefore, removes the reliance on the operator, and

the latter removes the need for mental visualization of 3D images.

Neubauer *et al.* used this X-ray-based approach to generate 3D volumetric images of 23 left coronary arteries (LCAs) and 17 right coronary arteries (RCAs) in their study of 23 patients. Two interventional cardiologists reviewed the 3D reconstructions and rated them with regard to quality and clinical utility.

Quality was assessed using a Likert scale of 1 to 5. Generally, the images were considered to be better than the intermediate quality score; average quality scores were 3.65 ± 1.12 for the LCAs and 4.26 ± 0.93 for the RCAs. Clinical utility was measured using five yes-or-no questions, with a 'yes' being assigned one point and a 'no' receiving zero points. The reviewers rated the images to be of intermediate clinical utility; average

scores were 3.05 ± 1.36 for the LCAs and 3.00 ± 0.92 for the RCAs. True positive rates were high (90–100%) whilst false positive rates were low (0–8.1%), and quantitative coronary analyses demonstrated good agreement between 2D images and 3D reconstructions ($r^2 = 0.9$).

According to the investigators, their results indicate that “the development of 3D reconstruction of coronary arteries should not be judged as a replacement for 2D angiographic images but, instead, as a means to expand the clinical utility of the acquired images”. They believe that “these results justify the further development of this technique for in-room use”.

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Original article Neubauer, A. M. *et al.* Clinical feasibility of a fully automated 3D reconstruction of rotational coronary X-ray angiograms. *Circ. Cardiovasc. Interv.* 3, 71–79 (2010)



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