

DualFlow - A Cardiac Case Study

MEDRAD CT

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Patient

A fifty-six year old male patient, presenting with atypical chest pain and hyperkinetic heart syndrome, is referred for a cardiac CTA scan to rule out coronary artery disease.

Scanner

The investigative team performed a study with a 64-detector-row CT scanner (Siemens, Sensation 64, Forchheim, Germany). The scan parameters were as follows:

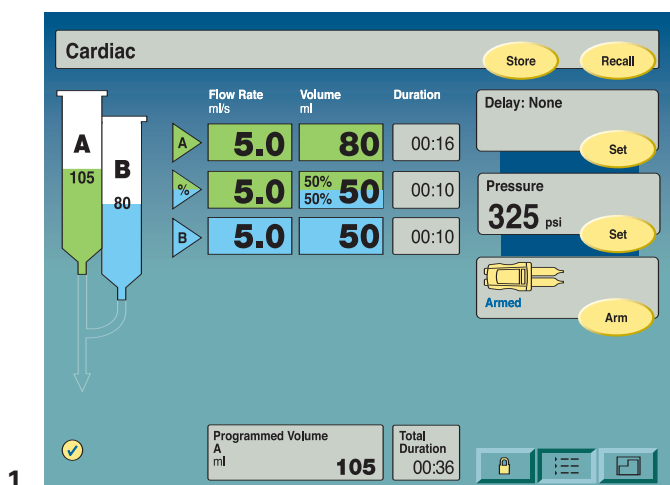
- Tube current 500 mA
- Tube voltage 120 kV
- Collimation 64x0.6 mm
- Pitch 0.2
- Scan time 10 s.

Contrast Injection

- Phase one 80 ml contrast injected at 5 ml per second
- Phase two 50 ml of 50% contrast, 50% saline at 5 ml per second
- Phase three 50 ml of saline at 5 ml per second

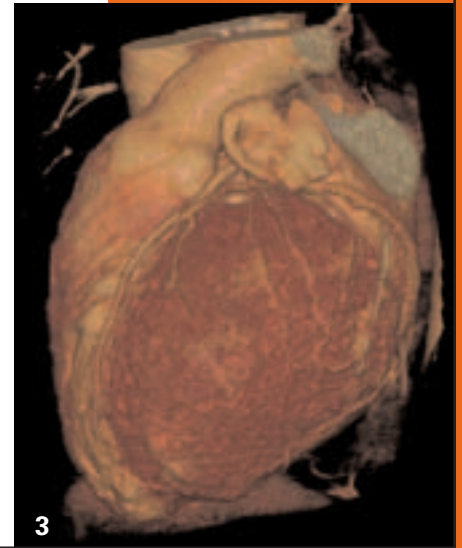
Contrast media (Ultravist 370, Schering, Berlin, Germany) was injected by a dual syringe injector (Stellant® D, MEDRAD®, Indianola, Pennsylvania, USA) via 18G antecubital vein (Fig 1).

The contrast bolus in the ascending aorta triggered the CT scan automatically upon detection with a threshold of 100 HU and with an additional delay time of 6 s to allow for automatic patient breathing (inspiration) instruction.



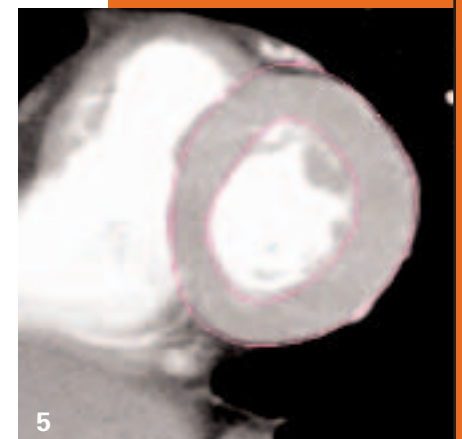
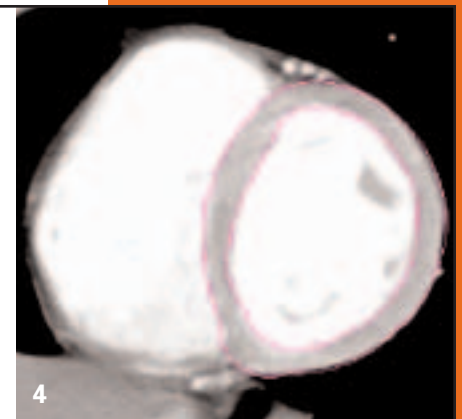
Scanning and Post-processing

The axial and short axis scans were reconstructed with 0.75 mm and .80 mm slice thickness, respectively. Volume rendering reconstruction on the base of the axial images was performed (Fig 2 & 3). The the short axis images were loaded into a post-processing workstation (Siemens, Leonardo, Forchheim, Germany) and analyzed for functional parameters.



Results

Functional parameters were all in the normal range (ejection fraction 60%, myocardial mass 102 g). Clear delineation of coronary artery tree showed no evidence of atherosclerosis or stenosis (Fig 4 & 5). Coronary CTA has a high negative predictive value (98%) compared to cardiac catheter according to a number of studies. Therefore, the investigative team excluded coronary artery disease as the source of the patient's complaints.



Conclusions

The dedicated contrast protocol with high flow rate at the beginning allows for high enhancement of the left ventricle and the coronary arteries in the range of 350 HU. This enhancement allows visualization of even the smallest side branches of the coronary artery tree in the periphery.

The second part of the contrast protocol with diluted contrast is designed to achieve a homogenous enhancement of the right ventricle for the delineation of the myocardial septum. This contrast bolus must not be too dense to avoid artifacts in the superior vena cava that may cause streak and beam hardening artifacts, which could interfere with visualization of coronary arteries. DualFlow is ideally suited to determine both coronary artery morphology and cardiac function, simultaneously.

Stellant D with DualFlow provides the mixture of contrast and saline at a measured ratio through simultaneous motion of both pistons. The effect is delivery of a diluted contrast to achieve an enhancement of the right ventricle similar to the enhancement of the left ventricle for clear delineation of the myocardial septum without compromising the coronary artery tree.

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