

Can Single Phase Prospective Cardiac CT Be Used to Detect Abnormal Cardiac Chamber Function?

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Background:

Recently, low-dose prospective scanning techniques have been developed for cardiac CT and are gradually replacing traditional spiral techniques. One disadvantage of this approach is that only a single mid-diastolic (MD) cardiac phase is available, meaning that traditional cardiac functional analysis can no longer be performed. MD chamber volumes can be measured however there are no known normal values.

Aim:

1. To define normal values for the left ventricular (LV) and left atrial (LA) volumes at MD;
2. To determine the relationship between MD and the well characterized end-diastolic (ED) and end-systolic (ES) volumes;
3. To determine whether use of these data can be used to identify patients with LV enlargement, LA enlargement and LV dysfunction (ejection fraction < 45%).

Methods:

153 consecutive CT scans from our database were included, involving both inpatients and outpatients, referred to rule out coronary artery disease. LV and LA volumes were calculated using semiautomatic commercially available software, at ED, ES and MD. Of these, 73 were identified as normal (no diabetes or hypertension and normal function by CT) and used to characterize normal values.

Results:

MD volumes and ED volumes of the LV were highly correlated ($r=0.99$) as were the MD volumes and the ES volumes of the LA ($r=0.98$). SEE of the regression lines were small, 5.4ml and 3.4ml for LV and LA volume indices, respectively. Abnormal LV MD volumes had 91% sensitivity and 100% specificity to identify LV enlargement. Increased LA MD volumes had 100% sensitivity and 95% specificity to identify LA enlargement. Abnormality of either LV or LA MD volume had 88% sensitivity and 85% specificity to identify patients with EF < 45%.

Conclusions:

A single MD phase, as obtained in prospective cardiac CT scans, can be used to identify patients with cardiomegaly or LV dysfunction with a high degree of accuracy.