



# Cardiac CT Applications with Multi-Slice CT

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## INTRODUCTION

Atherosclerotic coronary artery disease is a major burden on the health care system world over.

Non-invasive coronary artery imaging is now a reality with CT. At least 2.5 lakh people a year die of a heart attack within one hour of the onset of symptoms and before they reach a hospital. 12 million people alive today have a history of heart attack, chest pain or both.

A meta-analysis of coronary heart disease prevalence in India done in 1996 revealed that there has been a 9-fold increase of coronary heart disease in urban population from 1960's to 1990's and a 2-fold increase in the rural population from 1970's to 1990's. (Gupta, et al. Indian Heart Journal May-June 1996 vol.48 no. 3, 241-245)

The overall prevalence of coronary artery disease in urban India is 11%, 6.2% for males and 14.8% for females. ( Vishwanathan Mohan et al. Journal of American College of Cardiology, Sept. 2001 vol. 38 no. 3)

## NON-INVASIVE MODALITIES TO DIAGNOSE CARDIAC DISEASE

**ECG:** baseline test with sensitivity of 42% and specificity of 80%.

**Exercise Stress Test:** Sensitivity of only 68%.

**Thallium Stress Test:** studies the perfusion of the heart muscle and not the coronary status per se with sensitivity of 88%, but specificity of 54%

**Catheter Angiography:** gold standard but invasive.

**CT Coronary Angiography:** capable of showing and evaluating coronary arteries as good as catheter angiography and in a non-invasive way.

## WHO SHOULD UNDERGO CT CORONARY ANGIOGRAPHY ?

All persons with high risk factors are potential candidates.

### High Risk Factors

- Strong Family History.
- Diabetes.
- High Blood Pressure.
- Obesity.

**Table 1:**

Author	Sensitivity	Specificity	-ve Predictive Value
KOPP, <i>et al</i>	86%	93%	99%
ACHENBACH, <i>et al</i>	91%	84%	97%
BECKER, <i>et al</i>	82%	97%	98%

High Cholesterol.

Stressful and High Tension Jobs.

Alcoholics and Smokers.

## WHO SHOULD WORRY?

Changing lifestyle.

Dietary habits.

Less physical activity.

Irregular or no exercise.

Any person above the age of 40.

## Traditional CAD Risk Factors

Traditional CAD risk factors are incomplete in predicting CAD events.

50% of patients with an acute MI have normal cholesterol profiles.

Sudden death is the FIRST (and last) sign of CAD in 150,000 people/year.

**Primary prevention** - strategies to prevent development of CAD (asymptomatic). Identify risk factors, measure subclinical atherosclerosis, diet restrictions and cholesterol lowering drugs.

## This is the Future

**Secondary prevention** - aggressive medical and surgical therapy in those that have had a MI or have angina.

## This is the Present.

## CT Coronary Angiogram Vs Cath Coronary Angiogram (See Table 1).

## CARDIAC CT APPLICATIONS

Coronary calcium scoring.

CT coronary angiography.

Miscellaneous e.g. evaluation of a mass lesion , evaluation of the heart chambers, pericardium etc.



## CORONARY CALCIUM SCORE

Detection and quantification of calcium present within the coronary arteries using multi-slice CT with ECG-gated imaging.

Ca++ is absent in normal vessel walls. Ca++ is more common in the elderly and advanced lesions.

Coronary calcium is not an inevitable part of growing older.

A negative CCS does not rule out atherosclerotic disease but does imply a low likelihood of significant luminal obstruction.

A high CCS is consistent with a moderate to high risk of a cardiovascular event within the next 2-5 years. The more extensive the coronary calcification, the more likely that a coronary event may occur.

*(Coronary artery calcification: Pathophysiologic, Epidemiology, Imaging methods and Clinical implications AHA writing group Circulation vol. 94, no. 5 Sept. 1, 1996)*

## PATIENT PREPARATION

No caffeine for 12 hours prior to the exam.

Fasting for 4 hrs prior to the study

Everyone gets beta-blockers.

Metoprolol 100 mg. One hour before the study.

Second dose of Metoprolol 50 mg. if HR>62

Antecubital vein only.

Office procedure and no admission is required.

15 mins to complete the procedure.

## MEDICATIONS AT SCAN TIME

If stenosis correlation is critical give nitroglycerin.

All caths are done with nitro and correlation will *theoretically* be better.

Nitro spray 1/150gr. sl.

Nitroglycerin contraindications-Allergy, Viagra.

## INJECTION PARAMETERS

Non-ionic contrast.

RATE OF 4 cc/sec.

At 300 psi pressure.

20 g cannula in ante-cubital vein.

Manual timing bolus = 20cc contrast.

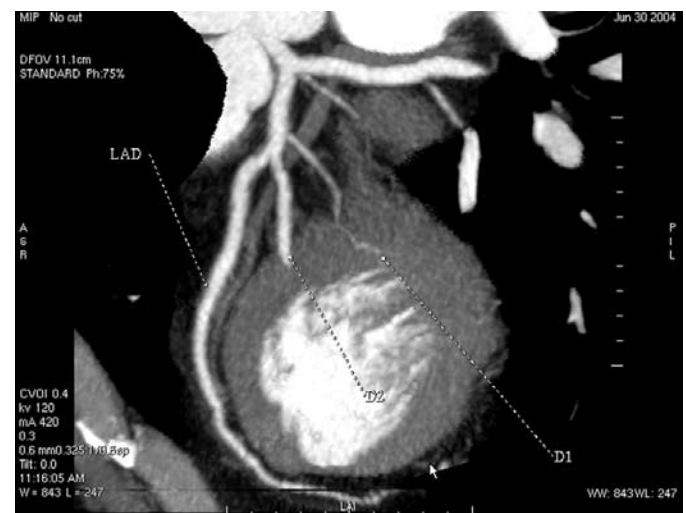
Coronary CTA = 80-100 cc contrast.

## IMAGE RECONSTRUCTION

Maximum intensity projection.

Volume rendering.

Curved multiplanar reformation.



## LAD FUSIFORM ANEURYSM

