

Sequential Versus Helical Scanning for Coronary Age Estimation using Dual Source 64 Slice MDCT

S. Mary Sushmitha¹, K. Rohit²

¹MBBS, DMRD, DNBRad,

²MBBS, MDRD

Abstract: *Background:* Coronary artery disease (CAD) is the most common type of heart disease and is the leading cause of death globally. It is the disease affecting the coronary arteries which supply the myocardium with oxygen and nutrients. In about 50% of patients with Coronary artery disease, the first manifestation is either sudden death or acute myocardial infarction. *Objectives:* To estimate and compare the coronary age (vascular age) by sequential and helical scanning methods using syngovia workstation. *Methodology:* *Study Design:* Longitudinal study. *Study Settings:* Department of Radio-diagnosis and imaging, Billroth Hospitals, Chennai. *Study Duration:* The study was conducted from May 2014 to November 2014. *Study Population:* Sixty five patients underwent 64-slice dual source CT coronary artery calcium scoring followed by CT coronary angiography. *Results:* Wilcoxon Signed Ranks Test was applied to compare sequential and helical calcium score measures. The result showed that there is no significant difference between these methods ($P = 0.820$) except left circumflex and right coronary artery.

1. Introduction

Coronary artery disease (CAD) is the most common type of heart disease and is the leading cause of death globally. It is the disease affecting the coronary arteries which supply the myocardium with oxygen and nutrients ¹. In about 50% of patients with Coronary artery disease, the first manifestation is either sudden death or acute myocardial infarction ².

More than 95% of all coronary artery disease is due to atherosclerosis. During the course of early atherosclerotic disease, the changes that occur in the arterial wall include deposition of cholesterol and fibrous tissue. Later on calcium also gets deposited within the arterial wall which adds on to the effect of luminal narrowing ³. Because of the increased mortality and morbidity caused by Coronary artery disease, the need for its early diagnosis has become inevitable.

Aims and Objectives

To estimate and compare the coronary age (vascular age) by sequential and helical scanning methods using syngovia workstation.

2. Methodology

Study Design: Longitudinal study

Study Settings

Department of Radio-diagnosis and imaging, Billroth Hospitals, Chennai.

Study Duration

The study was conducted for a period of 7 months.

Inclusion Criteria

- 1) Patients referred to the department of radio-diagnosis by the physician for CT coronary angiography.
- 2) Patients who come by themselves in view of family history of coronary artery disease or other comorbid risk

factors like hypertension, diabetes mellitus hypercholesterolemia.

Exclusion Criteria

- 1) Patients aged < 40 years.
- 2) Patients with arrhythmia.
- 3) Patients who have undergone previous bypass surgery or coronary artery stenting.
- 4) Patients who have mechanical prosthetic valves and pacemakers.

Study Population

Sixty five patients underwent 64-slice dual source CT coronary artery calcium scoring followed by CT coronary angiography.

Data entry and analysis

Data collected was entered in Microsoft excel and analysed using SPSS version 16.0. To compare between Sequential and Helical methods Wilcoxon Signed Rank sum test was applied. To find the relationship between Sequential and Helical methods Spearman rank correlation was used. To compare between hypertensive versus non-hypertensive and also diabetic versus non-diabetic Mann Whitney U test was applied. P-Value < 0.05 was considered statistically significant.

3. Results

Our study included 65 patients who underwent coronary artery calcium scoring in both sequential and helical methods, followed by contrast enhanced coronary angiogram, with the 64 slice DSCT scanner. The patients included in the study were in the range of 40-76 years of age. Among the 65 patients who underwent CT Coronary artery calcium scoring in our study, 46 patients (70.8 %) were male and 19 patients (29.2 %) were female.

Spearman Rank Correlation (Spearman's rho) test was done to assess the relationship between sequential and helical

measures in left main coronary artery, Left anterior descending artery, left circumflex artery and right coronary artery. The result showed positive correlation with tendency to increase or decrease together with the correlation coefficient of more than 0.5. The P value was found to be highly significant (<0.001).

Wilcoxon Signed Ranks Test was applied to compare sequential and helical calcium score measures. The result showed that there is no significant difference between these methods (P = 0.820) except left circumflex and right coronary artery.

Table 1: Spearman (Spearman's rho) Rank Correlation between Sequential and Helical measures

Measurements	N	Correlation Coefficient	P-Value
LM	65	0.886	<0.001
LAD	65	0.978	<0.001
LCX	65	0.940	<0.001
RCA	65	0.957	<0.001
Total	65	0.984	<0.001

Table 2: Wilcoxon Signed Ranks Test to compare between Sequential and Helical measures

Measurement	N	P-Value
LM	65	0.820
LAD	65	0.287
LCX	65	0.008
RCA	65	0.032
Total	65	0.014

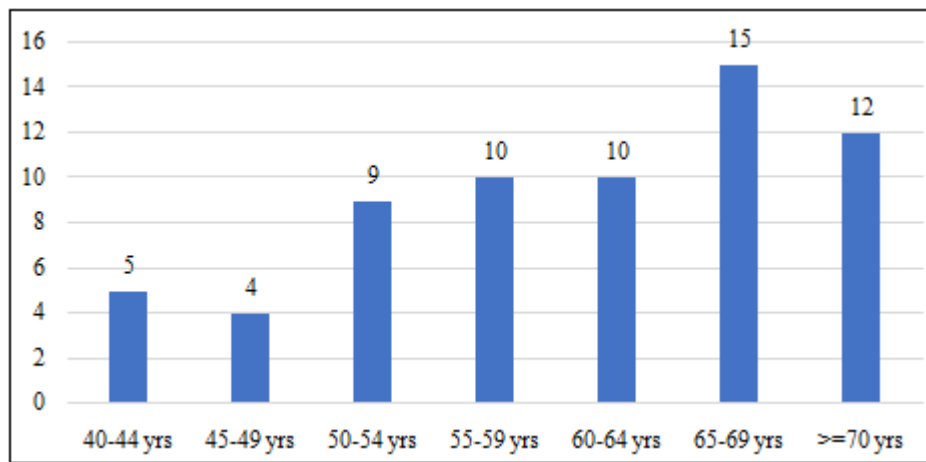


Figure 1: Age wise distribution of study participants

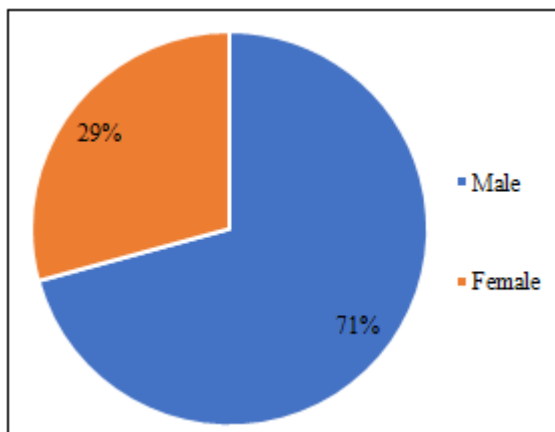


Figure 2: Sex wise distribution of study participants

4. Discussion

The overall burden of the coronary artery disease has drastically increased in India, because of the change in lifestyle, urbanization and sedentary habits. Presently Coronary artery disease has become the leading cause of mortality in India ⁴. Hence it has become mandatory to identify coronary artery disease before it manifests clinically. There are few studies which evaluated CT calcium scoring as a screening tool for coronary artery disease ⁵.

The electron beam CT introduced in 1980s is the accepted gold standard for coronary artery calcium scoring as proposed by Agatston et al in their study⁶ (10). Later in 1990s, the multidetector row technology with improved temporal resolution was developed, and hence coronary artery evaluation has become possible with the MDCT scanners also. The advent of dual source MDCT in late 2005, further improved the temporal resolution to 83 msec.

Assessment of coronary arteries using CT included contrast enhanced coronary angiography. Despite the fact that the contrast enhanced coronary angiography quantifies the plaque and stenosis in individual arteries, the CT coronary artery calcium scoring enumerates a numerical value for clinical risk stratification to decide about further line of management, especially when it is used as a screening modality.

The previous studies have proved that the calcium scores have close association with the atherosclerotic plaque burden, which were confirmed by both histopathology and intravascular USG ⁷ (36).

5. Conclusion

CT Coronary Angiography is the most reliable noninvasive modality for evaluating cardiac disease. In CT, cardiac scans can be performed by electron beam Tomography and Multidetector Computed Tomography (MDCT) scanners.

References

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