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Original Research Article

CT coronary angiography in symptomatic individuals: Descriptive clinical study

[1]Dr. Supriya AS, [2]Dr. Hemanth Purigali Naganna, [3]Dr. Raveendra N Mudiyammanavara, [4]Dr. Rashwin Pinto, [5]Dr. Rinu Pious, [6]Dr. Sadananda Billal, [7]Dr. Thilak KS, [8]Dr. Madhushree B

[1,4,5,7,8]Resident, Department of Radiodiagnosis, Mysore Medical College and Research Centre, Mysore, Karnataka, India
[2]Associate Professor, Department of Radiodiagnosis, Mysore Medical College and Research Centre, Mysore, Karnataka, India
[3]Assistant Professor, Department of General Medicine, Shivamogga Institute of Medical Sciences, Shivamogga, Karnataka, India
[6]Senior Resident, Department of Radiodiagnosis, Shivamogga Institute of Medical sciences, Shivamogga, Karnataka, India

Corresponding author: Dr. Rashwin Pinto

Abstract

Coronary arterial calcification occurs almost exclusively in atherosclerotic arteries, and is usually not seen in the normal vessel wall. So, the presence of any CAC is specific for atheromatous coronary plaque. As CAC can be present in both obstructive and non-obstructive lesions, CAC is not specific for obstructive coronary disease. Demographic details of the patient with history of risk factors, such as diabetes, hypertension, treatment for hypertension, dyslipidemia, smoking and positive family history was collected using a questionnaire which was part of the clinical research form. Indication for referral was noted. Among patients with coronary artery plaque (n=28), the left anterior descending artery (LAD) was the most commonly involved vessel (48%) followed by the right coronary artery (18%).

Keywords: CT coronary angiography, CAC, coronary arterial calcification

Introduction

Coronary artery disease (CAD) is a pathologic process that affects the coronary arteries resulting in its narrowing or complete blockage and is most commonly caused by atherosclerosis. Atherosclerosis is the process by which cholesterol and fatty deposits build up along the inner walls of arteries resulting in its narrowing, thereby restricting blood flow to the muscles of the heart. In both developing and developed countries, coronary artery disease is one of the leading causes of mortality and morbidity. Ischemic heart disease remains the leading cause of death and premature mortality worldwide, accounting for 9 million deaths [1]. Coronary artery calcification (CAC) is noticed in the early atherosclerotic lesions that appear in the second and third decades of life, but it is more often found in the advanced atherosclerotic lesions and in older age [2].

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atheromatous coronary plaque. As CAC can be present in both obstructive and non-obstructive lesions, CAC is not specific for obstructive coronary disease.
The site and the amount of coronary artery calcium and the percent of coronary luminal narrowing at the same anatomic site, the relation is nonlinear and has large confidence limits. As the occurrence of calcification reflects an advanced stage of plaque development, some researchers have proposed that the correlation between coronary calcification and acute coronary events may be suboptimal based largely on angiographic series [3].
In order to understand this apparent conflict between the stability of a calcified lesion and coronary artery disease event rates, one must recognize the association between atherosclerotic plaque extent and more frequent calcified and non-calcified plaque [4].
That is, patients who have calcified plaque are also more likely to have non-calcified or "soft" plaque that is prone to rupture and acute coronary thrombosis [4].

Noninvasive testing of atherosclerotic burden

Various noninvasive tests and imaging modalities have the potential to identify early coronary artery disease. These include exercise tolerance testing (ETT), stress echocardiography, Single photon emission tomography (SPECT scan), calcium scoring, cardiac CT and cardiac MRI. Non-invasive imaging modalities are efficient screening tools and help in detecting, measuring and monitoring CAD in asymptomatic individuals. Non-invasive modalities are more suitable for low/intermediate risk patients as they help identify those patients, who despite of their lower risk have significant coronary artery disease and are likely to require coronary revascularization.

Methodology

The sample size is calculated using the formula 4PQ/d2, the calculation is based on the prevalence of coronary artery disease as evaluated by CT coronary angiography which is equal to 7.8%, with 95% confidence interval and power of 80 and precision of 8.
In this study, after obtaining written consent from the patient, a detailed history along with complete clinical examination and laboratory investigations were done before the CT calcium score and coronary angiogram examination.
Sampling technique: Purposive sampling technique.
Type of study: Descriptive study.
Duration of study: 18 months.

Inclusion criteria

- The patients included in the study are symptomatic patients with symptoms like chest pain.

Exclusion criteria

- Hypersensitivity to contrast agent. Deranged renal function tests.
- Pregnant women.

Data collection

Demographic details of the patient with history of risk factors, such as diabetes, hypertension, treatment for hypertension, dyslipidemia, smoking and positive family history was collected using a questionnaire which was part of the clinical research form. Indication for referral was noted.

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Results

Table 1: Age Wise Distribution of Coronary Artery Plaque Table

Age (Years)	Frequency	Percentage
<40 Years	4	14%
40-49 Years	9	32%
50-60 Years	9	32%
>60 Years	6	22%

Table 2: Sex Wise Distribution of Coronary Artery Plaque

Sex	Frequency	Percentage
Male	20	71%
Female	8	29%
Total	28	100%

Table 3: Risk Factor Wise Distribution of Coronary Artery Plaque

Risk Factor	Frequency
DM	10
HTN	8
Dyslipidemia	10
Smoking	14

Among patients with coronary artery plaque (n=28), the left anterior descending artery (LAD) was the most commonly involved vessel (48%) followed by the right coronary artery (18%).

Table 4: Distribution of atherosclerotic plaque in the coronary arteries among patients with coronary artery disease

Vessel Involved	Frequency	Percentage
RCA	9	18%
LMCA	8	16%
LAD	24	48%
LCX	7	14%
Diagonal	1	2%
Marginal	0	0%
PDA	0	0%
RI	1	2%

Out of 45 cases included in the study 35 cases had right circulation & 10 cases had left dominance.

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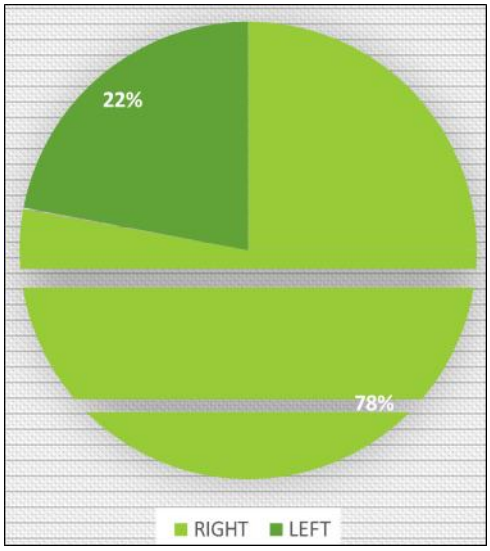

Fig 1: Dominance

Ramus intermedius was present in 12 patients out of 45.

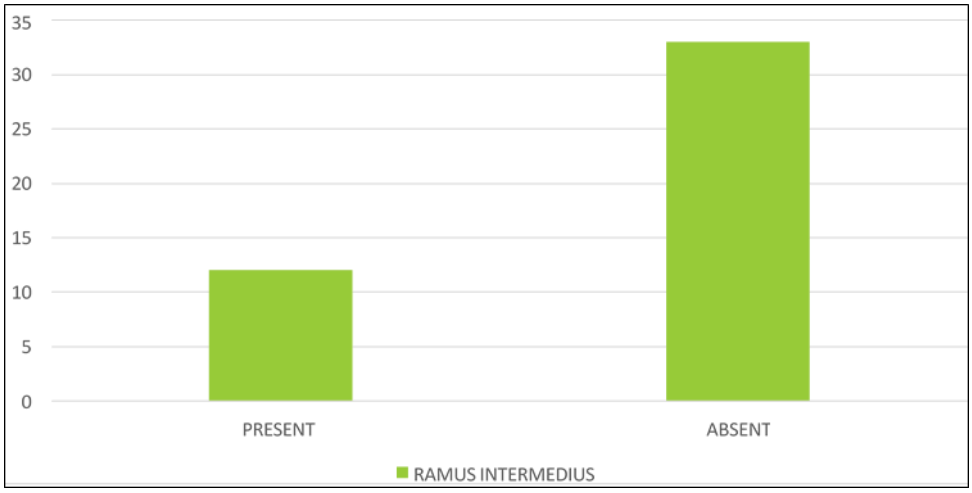

Fig 2: Ramus Ntermedius

Table 5: Plaque Characterization by Coronary CT Angiography

Plaque Morphology	Frequency	Percentage
Calcified	16	34%
Non-calcified	24	53%
Mixed	6	13%

Table 6: Stenosis caused by non-calcified plaque

Stenosis	Frequency	Percentage
Minimal (1)	5	21%
Mild (2)	4	16%
Moderate (3)	7	29%
Severe (4)	7	29%
Occluded (5)	1	4%
Total	24	100%

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Table 7: Stenosis Caused by Calcified Plaque

Stenosis	Frequency	Percentage
Minimal (1)	11	69%
Mild (2)	3	19%
Moderate (3)	1	6%
Severe (4)	1	6%
Occluded (5)	0	0%
Total	16	100%

Table 8: Stenosis Caused by Mixed Plaque

Stenosis	Frequency	Percentage
Minimal (1)	0	0%
Mild (2)	1	17%
Moderate (3)	2	33%
Severe (4)	3	50%
Occluded (5)	0	0%
Total	6	100%

Discussion

A total of 45 patients referred for CT coronary angiogram for various indications were included in our study. Of these chest pain was the most common indication for referral followed by difficulty in breathing. Our study included patients from 30 to 70 years of age. The mean age in this group was 49.5 years.50 to 70 years was the most common age group. Out of the 45 patients 29 were male and 16 were female. Diabetes, hypertension, dyslipidemia & smoking were almost equally prevalent among the study population.

All these 45 patients underwent both Coronary artery calcium scoring and CT coronary angiogram. Right circulation was the dominant circulation present in 35 cases (78%) & ramus intermedius was present in 12 cases (27%). All the vessels were analyzed on segment to segment basis for any stenosis and if there was any stenosis they were graded accordingly [5, 6].

Of the 45 patients referred for CTCA, coronary artery disease was present in 28 patients (62%), the rest of the 17 patients had no coronary artery plaque.

The incidence of coronary artery disease was found to be more in males and among smokers.

Left anterior descending artery was the most common vessel involved by coronary artery disease.

Non-calcified plaque was the most common morphology of the plaque.

In our study, moderate to severe stenosis was predominantly seen in non-calcified plaques & mixed plaques; minimal stenosis was predominantly see in in calcified plaque.

Calcium scoring was done for each patient. AGASTON scoring was used as standard. Coronary artery calcification was present in 22 patients, the mean calcium score in these patients was 90.

9 patients with a calcium score of zero had coronary artery disease, with 6 of them having severe stenosis of 70 to 99%. In 12 patients with Agatston score of <100 HU, 4 patients had moderate stenosis of 50 to 69%. Coronary artery calcium score of >400 HU was present in only one patient and the patient had severe stenosis of 70 to 99% [7, 8].

Conclusion

The incidence of coronary artery disease was found to be more in males and among smokers.

Left anterior descending artery was the most common vessel involved by coronary artery disease.

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Non-calcified plaque was the most common morphology of the plaque.

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