ROLE OF MULTI SLICE COMPUTED TOMOGRAPHY (MSCT) IN EVALUATION OF CORONARY ARTERY

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ABSTRACT

Background: Coronary heart disease (CHD) is a major cause of mortality and morbidity all over theworld. According to a report of World Health Organization (WHO) in 2005, cardiovascular disease (CVD) caused 17.5 million (30%) of the 58 million deaths that occurred worldwide.

Objective: To evaluate the role of MSCT in cardiovascular risk assessment in asymptomaticpeople.

Methods: Total 109 patients; 81 patients who are referred from the departments of cardiology with suspicion of coronary artery disease based on CAD consortium score, patients with stent for stent evaluation and 28 asymptomatic patients underwent Plain CT chestfor other purpose (with incidentally detected calcium) are included in our study. Duration of study was 15 months from June 2020 to September 2021.

Result: Evaluation of distribution of calcium scores among high and lowprobability groups revealed higher calcium score has got association with CAD risk.

Evaluation of association between higher calcium score and significant (>50%stenosis) stenotic lesions revealed high calcium score (>400) got clinically significantassociation with clinically significant (50%) stenosis with no statistical significance. Evaluation of diagnostic performance of CTCAG in detection and grading of stenosisin comparison with gold standard (ICA) revealed accuracy of CT CAG is more inestimating moderate and highgrade stenotic lesions compared to lesions with mildstenosis.

Conclusion: Evaluation of association between higher calcium score and significant (>50%stenosis) stenotic lesions revealed high calcium score (>400) got clinically significantassociation with clinically significant (50%) stenosis with no statistical significance. Evaluation of diagnostic performance of CTCAG in detection and grading of stenosisin comparison with gold standard (ICA) revealed accuracy of CT CAG is more inestimating moderate and highgrade stenotic lesions compared to lesions with mildstenosis.

Keywords: Low and Very Low Pre-Test Probability, Multi Slice ComputedTomography, Coronary Artery.

INTRODUCTION:

Coronary artery disease (CAD) is leading cause of death worldwide. For persons aged 40 years, the lifetime risk of developing CHD is 49 percent in men and 32 percent in women. Many CAD patients are asymptomatic, and early detection and treatment of CAD can reduce the incidence of acute myocardial infarction (1). The investigation aims to diagnose either myocardial ischaemia (by non-invasive functional testing) or luminal stenosis (by anatomical imaging). Although invasive coronary angiography remains the standard for the detection of CAD, it is reserved for patients whose clinicalrisk is assessed as high or when stress testing indicates significant ischemic burden.

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From a medical point of view, CT coronary angiography should be recommended as atest to rule out obstructive coronary stenosis in order to avoid inappropriate invasive coronary angiography in patients with an intermediate pretest probability of CHD (2).Clinical practice guidelines in the United States and Europe consider CAC scoring to be a potentially useful way of improving cardiovascular risk assessment in asymptomatic people and serving as a guide for initiating or deferring preventive therapies as there is strong association between CAC and major cardiovascular outcomes in asymptomatic people. Cost-effectiveness analyses also have concluded that CAC testing is cost effective in asymptomatic populations.

In these patients, the purpose of imaging is to rule-out CAD. The high sensitivity and high negative predictive value of coronary CT support its role in and ruling out CAD (3).

But for patients with acute chest pain in whom acute coronary syndrome (ACS, including MI and unstable angina) is suspected, in patients with a high pre-testprobability (>70%) of significant CAD and in patients with the calcium score >400, a rule-in test is required and ICA is recommended as the most cost-effective method of imaging the coronary arteries, allowing simultaneous revascularisation, there is no rolefor coronary CT. In patients with a moderate pre-test probability of CAD (30–60%), non-invasive functional imaging is recommended as the most cost-effective test to detect myocardial ischaemia. Based on their estimated likelihood of having CAD, patients are offered appropriate diagnostic investigation. A series of studies revealed that patients with CACSs of zero had <1% probability of significant coronary stenosis.Thus, such patients may not require further imaging with CCTA (4). Plank et al. revealed that a CACS of zero could not exclude CAD, so patients should undergo CCTA if they have diabetes or low lifetime risk, with borderline or non-specific mild pathology in the ECG-treadmill stress test, likewise CACS of zero does not carry the same high negative predictive value in symptomatic patients as arterial calciumscanning may not identify unstable plaques that are prone to rupture directly, so the recommendation is to proceed to formal CTCA. CT characteristics of atheromatous plaques were proven to have therapeutic and prognostic implications. Non-calcified plaques have been shown to have significantly increased risk of major adverse cardiac events, higher tendency to regress in response to established medical therapies. So earlydetection and treatment can reduce incidences of acute myocardial infarction. Calcifiedplaques are usually more stable than non-calcified plaques (5). Nevertheless, higher

CAC score implies a poorer clinical prognosis in patients with stable coronary heart

The second issue is technical: the coronary angiography performed for graft imaging is more difficult than for native vessels, due to the variation of location of the graft's ostia (6). CCTA also provide information of lungs, noncoronary cardiovascular data of significance including myocardial, pericardial, and valvular morphology, pulmonary arteries, aorta.

The ability to visualize coronary artery lumen and wall, obtain information on the presence, severity and characteristics of coronary artery disease non invasively, MDCT is a better diagnostic tool compare to others including nuclear perfusion imaging or invasive coronary angiography.

CCTA may also provide information about the presence of extra luminal plaque and plaque composition that is not routinely available on ICA without the use of intravascular ultrasound. and additionally contains information of lungs, non coronary cardiovascular data of significance including myocardial, pericardial, and valvular morphology, pulmonary arteries, aorta (7, 8).

MATERIAL AND METHODS

This prospective observational study was conducted in the department of radiology and imageology, Nizam's Institute of Medical Sciences, Hyderabad. Total 109 patients; 81 patients who are referred from the departments of cardiology with suspicion of coronary artery disease based on CAD consortium score, patients with stent for stent evaluation and 28 asymptomatic patients under went Plain CT chestfor other purpose (with incidentally detected calcium) are included in our study. This is done over a period of 15 months from June 2020 to september 2021. Approval of stusy was taken an institutional scientific and ethical committee. Written informed consent was obtained from all the patients.

Inclusion Criteria:

1. Patients aged between 30-65years and irrespective of gender who are referred to the radiology and Imageology department with a clinical diagnosis of CAD for evaluation.
2. All patients with diagnosed CAD post stenting will be included to evaluate the statusof stents.

Exclusion Criteria:

1. Patients with post CABG
2. Patients contraindicated to iodine containing contrast agents.
3. Active bronchospasmotic disease, hypertrophic cardiomyopathy, severe aortic valve stenosis, second or third-degree heart block, and systolic blood pressure < 100 mm Hg or other precautions or contraindications to b-blockers and nitroglycerin
4. Atrial fibrillation.
5. Sick sinus syndrome or AV block greater than 1st degree.
6. Heart rate >65bpm despite beta blockers.
7. Renal insufficiency and risk of contrast-induced nephrotoxicity.
8. Hypothyroidism (thyrotropin level <0.44mIU/L).

Imaging Protocol and Technique

- CT CORONARY CALCIUM SCORE and ANGIOGRAM done in all cases using 128 slice- MDCT(SOMATOM Definition AS+ / SEIMENS, single source system) which allows for a temporal resolution of 150 ms, rotation times of 330 ms. The scan parameters used for any cardiac CT should be tailored to the individual patient but also the intended application.
- On arrival at the imaging center, patient will be given pre-medication beta-blocker if the patient has nolready taken, followed by tab. ivabradine(5mg) prior to coronary CT to reduce

the heart rate to about 60 beats per minute, enabling optimum image acquisition. Then patient will be taken to CT scanning suite, where they will be askedto lie supine on the CT scanner couch and will be connected to ECG electrodes. Theseare attached to the CT scanner and enable ECG-gated image acquisition. Further intravenous beta-blockers (often metoprolol) may be used if necessary. Blood pressure should be monitored during the administration of beta blockers and nitrates (Usually, no more medication is given if BP is <100mmHg systolic). Once the patient is fully prepared for optimum image acquisition, the recommended first step in coronary CT isthe generation of a calcium score. Initially AP and Lat scout topogram of chest will beobtained to plan the study, followed by Non enhanced scan data acquisition of heart with prospective gating. The scan range extends from below the carina to below the level of the heart. An operator selects vessels with observable calcium and thecomputer then derives the score based on the Agatston equivalent scoring system. Scanparameters used are:

- For AP topogram covering the chest obtained with following scan parameters: kVp (CARE)120, mAs 35, Slice thickness-0.6 mm.
- Non -contrast cardiac CT for ca score will be done in axial mode with Prospective ECG-gating with following scan parameters: kVp (CARE)120, mAs: 100 mAs, Slice thickness-1.00mm. Data acquisition:128X0.6, scan time:230ms, Rotation time:330ms.Imaging will be performed in supine position, in cranio-caudal direction with breath holding at maximum inspiration. Axial reconstruction will be done from the acquired data within the ECG trigger window, during best diastole with WFBP algorithm, Convolution kernel: B26f for normal and B46f for stent protocol, with Slice thickness:3 mm, Increment: 1.5 mm. Field of view limited to the heart.
- For a diagnostic CTCA, approximately 85–100ml contrast will be given by automated contrast injection using a dual cylinder injector and biphasic saline chasingtechnique (85 to 100 ml of non-ionic contrast media, with concentration of 350mg of iodine per millilitre) with a fast injection rate of 5.5ml/sec followed by 50 ml of salinewith a rate of 5.5mL/sec. For optimal timing to acquire the data after contrast injectionBolus-tracking technique will be used, in which the trigger threshold of 150 HU at 120 kVp will be set over the descending aorta at the level of carina. The CTA acquisition is automatically triggered when the vessel enhancement reaches the predefined HU level (100- 150HU) above the baseline. Scanning will be performed in in supine position, in cranio-caudal direction with breath holding at maximum inspiration (relaxed inspiration, patient will be asked to breathe in and hold their breath for the fewseconds it takes for the scan to be performed because of the physiological effects of elevated intrathoracic pressure (Valsalva manoeuvre), which can reduce the inflow ofcontrast medium). Retrospective ECG gating technique with ECG-gated tube current modulation will be used to acquire the data.
- CARE Bolus (automatic bolus tracking) monitors the attenuation within the vessel of interest (descending aorta). Scans are set up in the descending aorta at the level of the carina with delay of 10 s.
- Coronary CT angiography Imaging will be performed with following parameters: kVp: 120 kVp, kV will be automatically selected by CARE kV (If the patient has highcalcium or stents consider the Care kV setting to ‘Semi’ or adjust the kV), mAs:200 mAs, Slice/Collimation: 128 x 0.6 mm, rotation time: 0.33sec, scan time:: 9.88sec. Axial reconstruction will be done from the acquired data within the ECG trigger window, data during best diastole with WFBP algorithm, Medium smooth convolutionkernel B26f (If the patient has high calcium consider a sharper convolution kernel), Choose Best Systole and Millisecond unit for arrhythmic heart rates with Slicethickness: 0.6 mm, Increment: 0.4 mm • Field of view limited to the heart
- The patient will then be disconnected from the ECG electrodes and their tolerance of the scan confirmed. Because of orthostatic effects of beta-blockade and nitroglycerinadministration, the patient will be asked to get up slowly. After a brief period of observation in the department, the patient is free to leave. The entire CT scan should take less than 10–15 minutes. Curved multiplanar reformats, MIP and 3D volume rendered images can then be obtained to assist in the assessment of the coronary arteries.

Imaging Analysis

The coronary artery calcium score is measured on plain scan in all patients (except in patients with a prior history of stenting) by the Agatston method with a threshold value of 130 HU. Vessel evaluation (plaque detection, plaque characterization andestimation of stenosis if any), evaluation of stent status done on post contrast images. The initial assessment is made using the axial source images followed by the post- processed images. The origins of the vessels are first evaluated, followed by the evaluation of each coronary artery from its respective ostium to its most distal extent. Various post-processed images, such as short-axis views, curved reformations, long axis extended views of the lumen, and 3D surface shaded volume-rendered images, can be obtained to evaluate individual coronary arteries in various projections.

Statistical Analysis:

Standard proforma are used for individual case record. Microsoft excel software is used to analyze the data. Charts and tables are prepared for representation of data.

RESULTS

Out of 109 cases, males were (81 cases, 76%) and females were 28 (24%).

12 cases were in 30-40 years age group - 9 of them were males, 3 were females. 32 cases were in 41-50 years age group - 8 females and 24 males. 45 cases were in the 51-60years age group - 9 were females and 36 were males. 20 cases were in 61-69 age group - 8 were females and 12 were males.

Table 1: Descriptive Statistics

Variable	
Age	56.18 ± 9.54 years
Sex	
Males	81 (76%)
Females	28(24%)
Patients with CS zero	40 (36%)
Patients with CS >0	59(64%)
Total Plaques detected in CT	64
Calcified/Non calcified/Mixed	20/34/10
Total number of stents assessed in CT	29
Patients with extra coronary findings	12 (13.4%)

Table 2: Distribution of Study Population amongvarious Grades of Calcium Score.

CT-Coronary calcium score	**No of cases**	**Percentage**
0	40	37%
1-100	31	28%
101-400	19	18%
401-999	10	9%
>1000	9	8%

In 109 patients, CT coronary artery calcium score was assessed, in 40(37%) cases CS was zero. In 31 (28%) cases CS was 1-100. In 19 (18%) cases CS was 101-400. In 10(9%) cases CS was 401-1000. In 9(8%) cases CS was ≥1000. In our study majority patients were with zero calcium score.

Table 3: Showing Distribution of Calcium Scores Among Asymptomatic Patients**.**

CTCS	**No of cases**	**Percentage**
1-100	10	35%
101-400	6	22%
401-999	5	18%
>1000	7	25%

Out of 109 patients 28 were asymptomatic. Among 28 patients10 (35%) patients were with 1-100 CS. 6 (22%) were with 101-400 CS. In 5 (18%) cases CS was 401-1000. In 7 (25%) cases CS was ≥1000. Among 28 patients 16(57%) patients shown <400 CS. 12(43%) patients shown >400 CS.

Total 89 patients in low risk group. 28 patients in asymptomatic group. 30 patients in very low probability group. 31 patients in low probability group. In asymptomatic group coronary calcium incidentally detected on chest CT done for non – cardiac indication. They have not been evaluated for risk factors for risk stratification.

Out of 30 patients -16(53%) patients were showing no stenosis (normal).

Table4: Showing Distribution of Stenotic Segments among CS <400 and >400 inVarious Groups

	≤400	**>400**
Total number of cases	91	18
Number of significant stenotic segments	19	6

Among total 109 patients- 19 patients with CS<400 have shown significant stenoticsegments. 6 patients with CS >400 have shown significant stenotic segments.
Among total number of 18 patients with CS >400, 6(33%) patients having significant stenotic segments.
Among total number of 91 patients with CS <400, 19(21%) patients having significant stenotic segments.
Association between high calcium scores and significant stenosis evaluated with Chisquare test.
Test revealed high calcium score (>400) got no significant association with clinically significant stenosis. Chi square- 0.708 with p value-0.400.

Table 5: Showing Distribution of Instent Restenosis in Post-Stent Patients

Grade of stenosis	Number of patients	Percentage
No stenosis	9	45%
Mild	4	20%
Moderate	2	10%
Severe	5	25%

Out of 20 patients with stents 7 (35%) patients showed significant instentstenosis (>50% stenosis). Out of 20 patients -9(45%) patients were showing no stenosis (normal).

Table 6: Diagnostic Performance of CTCAG in Detection and Grading of StenosisCompared to ICA

	Mild	Moderate	Severe	Normal
CT-CAG	6	9	7	11
ICA	11	3	13	9

Table 7: Showing Sensitivity, Specificity, Positive and Negative Predictive Values of CT Coronary Angiogram for Non-Stented Coronary Artery

	Sensitivity	Specificity	PPV	NPV	Accuracy	Chi square test	p-value
Overall stenosis	73.6%	57.1%	70%	61.5%	66.6%	2.047	0.152
mild stenosis	50%	72.7%	40%	80%	66.6%	0.043	0.836
Moderate stenosis	66.6%	88.8%	66.6%	88.89%	88.3%	1.33	0.248
Severe stenosis	80.0%	88.89%	88.3%	80.0 %	84.2%	6.465	0.011

Diagnostic performance of CTCAG in detection and grading of stenosis in comparisonwith gold standard (ICA) estimated with Chi square test.
Overall sensitivity, specificity, positive predictive value, negative predictive value and accuracy of CTCA for CAD are 73.6%, 57.1%, 70%, 61.5% and 66.6%respectively, p-value 0.152. Sensitivity, specificity, positive predictive value, negative predictive value and accuracy of CTCA for detecting mild stenosis are 50%, 72.7%, 40%, 80% and 66.6% respectively, p-value 0.836. For moderate stenosis, the values are 66.6%, 88.89 %, 66.6%, 88.8and 88.3 % respectively, p-value- 0.248. For severe stenosis, the values are 80.0 %, 88.89%, 88.89%, 80.00 % and 84.2% respectively, p-value- 0.011.
Accuracy of CT CAG is more in estimating high grade stenotic lesions compared to mild and moderate stenotic lesions with statistically significant p- value

Table 8: Showing Degree of Instentrestenosis Comparison between CT-CAGand ICA

Slno	STENTED VESSEL	On CT-CAG	On ICA
1	LAD	Moderate	Moderate
2	RCA	Mild	Mild
3	LAD	Moderate	Mild
4	LAD	Moderate	Moderate
5	LCX	Normal	Mild

6	LAD	Severe	Severe
7	LCX	Severe	Moderate
8	LAD	Severe	Severe
9	LAD	Mild	Mild
10	RCA	Normal	Normal
11	RCA	Mild	Normal
12	LCX	Normal	Mild
13	LAD	Mild	Mild
14	LCX	Mild	Mild
15	LAD	Normal	Normal
16	RCA	Normal	Normal
17	LAD	Normal	Normal
18	LAD	Normal	Normal
19	LCX	Moderate	Moderate
20	RCA	Moderate	Mild
21	LCX	Severe	Severe
22	RCA	Mild	Mild
23	LAD	Mild	Mild
24	RCA	Normal	Normal
25	PDA	Severe	Severe
26	LCX	Mild	Mild
27	RCA	Severe	Moderate
28	LAD	Normal	Normal
29	OM	Severe	Moderate

Table 9. Showing Sensitivity, Specificity, Positive & Negative Predictive Values, Accuracy of CT Coronary Angiogram in Estimation of Instent Restenosis

	Sensitivity	**Specificity**	**PPV**	**NPV**	**Accuracy**	**Chi square test**	**p-value**
Overallstenosis	85.7%	66.6%	80%	75.0%	78.2%	4.51	0.03
mild stenosis	87.5%	85.7%	87.5%	85.7%	86.6%	5.3	0.02
Moderate stenosis	57.1%	85.7%	80.0%	66.0%	75.0%	1.07	0.301
Severe stenosis	57.6%	85.7%	80%	66.6 %	71.4%	1.22	0.265

Overall sensitivity, specificity, positive predictive value, negative predictive value and accuracy of CTCAG in estimation of instentrestonosis 85.7%, 66.6%, 80%, 75.0% and 78.2% respectively, p-value0.03. Sensitivity, specificity, positive predictive value, negative predictive value and accuracy of CTCA in detecting mild stenosis are 87.5%, 85.7%, 87.5%, 85.7% and86.6% respectively, p-value 0.02. For moderate stenosis, the values are 57.1%, 85.7%, 80.0 %, 66.0% and 75.0 % respectively, p-value0.301. For severe stenosis, the values are 57.6 %, 85.7%, 80%, 66.6% and 71.4% respectively, p-value0.265. CTCAG in evaluation of status of stent shown higher sensitivity and positive predictive value, with significant p-value 0.03.

DISCUSSION

In our study age of the patients ranged from 30 to 69 years with a mean age of 56.18 ± 9.54 years. According to Aggarwal A et al. (**9),** the mean age of onset of CAD in Southeast Asians 53 years as compared to the European figure of 63 years. Our study is correlating well with this statement.

In our study highest number of patients is in the 51-60 years age group (i.e 45 of 109 patients). According to Yazdanyar and Newman **(10),** the prevalence of CAD increases with age, both morbidity and mortality were high in the >80 years age group. The reason for disparity with our study was, the majority of the patients with age >70 were grouped into high risk and directly underwent ICA without CTCA.

In our study out of 109 patients 81(76%) are males, 28(24%) are females.This is consistent with a study conducted by Mannan et al. in which 74% are males **(11).** According to Towfighi et al (**12),** the cardiovascular disease develops 7 to 10 years later in women than in men. In our study we evaluated the distribution of calcium scores among high and low probability groups. In our study total 89 patients in low probability group. 20 patients are in high probability group. Distribution of calcium scores 0 Vs >0, ≤100 Vs >100, <400 Vs>400 among high and low probability groups estimated with Chi square test. Total 89 patients are in low probability group. Among 89patients 39(44%) patients arewith CS 0, 50(56%) patients are with CS >0. Total 20 patients are in high probability group. Among 20 patients 5(25%) patients with CS 0, 15(75%) patients are with CS >0.

Distribution of calcium scores (0 Vs > 0) among high and low probability groups estimated with Chi square test. Calcium score 0 Vs >0 shows clinically significant association with CAD risk assessment, But statistically got no association with CAD risk assessment p value 0.194.

Total 89 patients are in low probability group. Among 89patients 66(74%) patients are with CS≤100, 23(26%) patients are with CS>100. Total 20 patients are in high probability group. Among 20 patients 11(55%) patients with CS≤100, 9 (45%) patientsare with CS> 100. Distribution of calcium scores (≤100 Vs >100) among high and low probability groups estimated with Chi square test.

Calcium score ≤100 Vs >100 shows clinical association with CAD risk assessment. But shows no statistical association, p value 0.153.

Total 89 patients are in low probability group. Among 89patients 77(86.5%) patients are with CS≤400, 12(13%) patients are with CS>400. Total 20 patients are in high probability group. Among 20 patients 14(70%) patients with CS≤400, 6(30%) patientsare with CS>400. Distribution of calcium scores (≤400 Vs >400) among high and low probability groups estimated with Chi square test.

Calcium score (≤400 Vs >400) shows clinically significant association with CAD risk assessment. But statistically got no association, P value-0.143.

In our study ≤100 Vs >100 calcium score got better clinical association with CAD risk assessment. Various studies have shown that asymptomatic patients with a CAC score of zero havea low risk of cardiovascular events or all-cause mortality in the medium and long term.A meta-analysis, published in 2009 by Sarwar A et al(13), included 13 studies with a collective total of 29,312 patients and an average follow-up of 50 months. The authorsfound that, on average, a cardiovascular event occurred in 0.47% of the patients with aCAC score of 0 and in 4.14% of those with a positive score, corresponding to a relative risk of 0.15 (95% CI: 0.11-0.21; p < 0.001).In a 2007 cohort study conducted by Budoffet al(14), 25,253 patients were followed for up to 12 years (mean, 6.8 years). The authors found that, among the patients with a CAC score of 0, the mortality rate was low (0.4%), confirming the low long-term risk of mortality associated with such a score. In our study ≤100 Vs >100 calcium score got better clinical association with CAD risk assessment.

In our study we evaluated the association between higher calcium score and significant(>50% stenosis) stenotic lesions.

Total number of patients with calcium score ≤ 400 are 91. Total number of patients with calcium score >400 are 18.

Among total number of 91 patients with CS<400, 19(21%) patients having significant stenotic segments.

Among total number of 18 patients with CS >400, 6(33%) patients having significant stenotic segments.

High calcium score (>400) got clinically significant association with clinically significant stenosis, but statistically got no association, p value-0.400.

Study conducted by Tay SY et al(15) reviewed 934 consecutive patients who receivedCACS and CCTA .At least one cardiovascular disease risk factor was present in each of the 509 asymptomatic participants. Patients were grouped based on CACS into "zero," "minimal" (0 < CACS ≤ 10), "mild" (10 < CACS ≤ 100), "moderate" (100 < CACS ≤ 400), and "excessive" (CACS > 400). Males over 45 years old with diabetes mellitus and hypertension had a higher risk of significant coronary stenosis. In multivariate analysis, age, sex, hypertension, and diabetes mellitus remained significant predictors of stenosis. A CACS of zero occurred in 227 patients (44.6%). There were no significant differences between the "zero" and "minimal" groups (p = 0.421), but the "mild," "moderate," and "excessive" groups showed correlations with significant coronary stenosis.

Our study also revealed high calcium score (>400) got clinically significant associationwith clinically significant stenosis, but statistically got no association, p value-0.400.

In our study we evaluated the diagnostic performance of CTCAG in detection and grading of stenosis in comparison with gold standard (ICA). Overall sensitivity, specificity, positive predictive value, negative predictive value and accuracy of CTCAfor CAD are 73.6%, 57.1%, 70%, 61.5% and 66.6% respectively, p-value 0.152. Sensitivity, specificity, positive predictive value, negative predictive value and accuracy of CTCA for detecting mild stenosis are 50%, 72.7%, 40%, 80% and 66.6% respectively, p-value 0.836. For moderate stenosis, the values are 66.6%, 88.89 %, 66.6%, 88.8and 88.3 % respectively, p-value- 0.248. For severe stenosis, the values are 80.0 %, 88.89%, 88.89%, 80.00 % and 84.2% respectively, p-value- 0.011.

Accuracy of CT CAG is more in estimating high grade stenotic lesions compared to mild and moderate stenotic lesions with statistically significant p- value

Our study is correlated with study done by van den Boogert et al(16) which showed a sensitivity, specificity, PPV and NPV of 95.3%, 65.3% , 70.8% and 94.0% respectively, and systematic review and meta-analysis from 2007 by Abdulla et al(17). evaluated the diagnostic accuracy of 64-multidetector CT compared with conventional invasive coronary angiography (ICA) for coronary stenosis. Mean sensitivity and specificity of CCTA to detect and exclude significant stenosis on a patient basis were 98% and 91% respectively. Shrivastava et al(18). evaluated total of 300 vessels out of which 77 (25.6% 77/300) had significant stenosis, of this 73 (94.8%) were correctly identified by the 128 slice CT coronary angiography where as 4 (5.2%) lesions were missed on CT. Overall vessel based sensitivity, specificity, positive predictive value and negative predictive value of CT coronary angiography is 94.8%, 97.3%, 92.4%, 98.2% with diagnostic accuracy of 96.6%.

CONCLUSION

In our study evaluation of distribution of calcium scores among high and low probability groups revealed higher calcium score has got association with CAD risk.

Evaluation of association between higher calcium score and significant (>50% stenosis) stenotic lesions revealed high calcium score (>400) got clinically significant association with clinically significant (50%) stenosis with no statistical significance. Evaluation of diagnostic performance of CTCAG in detection and grading of stenosisin comparison with gold standard (ICA) revealed accuracy of CT CAG is more in estimating moderate and high grade stenotic lesions compared to lesions with mildstenosis.

Thus the CT coronary arteries is noninvasive screening and diagnostic imaging tool in patients with low and very low pre-test probability for CAD groups, thereby reducing the economic burden and morbidity associated with conventional angiography

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