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Original Research

Prognostic Value of Coronary CT Angiography in Patients With Suspected Coronary Artery Disease

[1]Dr. Saurabh Kumar, [2]Dr. Pallavi Aga, [3]Dr. Saurav Bhagat, [1]Dr. Siddharth Mishra, [1]Dr. Nitin Arun Dixit, [4]Dr. Anil Rawat

[1]Assistant Professor, Department of Radiology, King George Medical University, Lucknow (U.P)
[2]Associate Professor, Department of Radiology, GS Medical College & Hospital, Pilkhuwa (U.P)
[3]Assistant Professor, Department of Radiology, School of Medical Sciences & Research, Sharda University, Greater Noida (U.P)
[4]Associate Professor, Department of Radiology, King George Medical University, Lucknow (U.P)

Corresponding Author: Dr. Pallavi Aga

Email id- agapallavi.PA@gmail.com

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Abstract
Background: Severity and extent of coronary artery disease (CAD) assessed by Coronary computed tomography angiography (CCTA) guide treatment and may predict clinical outcome. Coronary computed tomography angiography (CCTA) has evolved as a logistically simple, accurate and low-risk non-invasive test primarily to rule out CAD with high negative predictive value. CTA also helps in assessing the other possible cause of typical and atypical chest pain, which is definitely an additional benefit over catheter angiography.
Aim: To find prognostic value of coronary CT angiography in our hospital in suspected patients with intermediate probability of CAD.
Methodology: The present study was conducted in the Department of Radiodiagnosis and Department of LARI Cardiology King George Medical University, Lucknow on 50 patients who underwent CCTA, and those coronary artery disease in CCTA were subjected to invasive coronary angiography (ICA). The Age range 34-76 years, 20 women and 30 males with heart rate range during CCTA was 55 to 75 beats per minute. Patients of all age groups, both sexes, referred for C.T coronary angiography, having acute chest pain with suspected coronary artery disease were included in the study, referred from Department of LARI Cardiology.

Result: All the cases had either one vessel or multi vessel involvement as a cause of chest pain with varying etiology, including the anomalous origin and course of coronary arteries to flow occluding atherosclerotic plaque. Anomaly of origin and course was observed in 3 (6%) and anomaly of course was observed in 5 (10%) cases. Right Dominant circulation was seen in 45 (90%) cases. In 4 (8%) cases, circulation was left dominant. In 1 (2%) case co-dominant circulation was seen. The overall specificity of MDCT coronary angiography in detecting coronary artery disease is 89.7%, with sensitivity in the range of 89.5%. There is fair agreement between the MDCT and catheter angiography for detecting the significant stenosis in coronary arteries.
Conclusion: Because of improved high temporal and spatial resolution MDCT provides the better detail of coronary anatomy and disease correlation of the patient. MDCT has got high NPV (approx.=92.9%) so it almost rules out CAD as the existing cause of acute chest pain and prevents unnecessary invasive catheterisation of patients.
Keywords: Coronary artery disease; CT angiography; invasive coronary angiography;

Introduction:

Cardiovascular disease (CVD) is a worldwide disease and the major contributor to reduced quality of life.[1] Historically, coronary artery disease (CAD) is defined as the presence of obstructive coronary artery stenosis ($\geq 50\%$) in one or more coronary vessels and most of current prevention and treatment protocols are in accordance with this paradigm: removing the obstruction for treating angina and preventing myocardial infarction.[2] However, recent research has demonstrated that approximately two-thirds of the patients were belong to without obstructive CAD in the CONFIRM (Coronary CT angiography evaluation for clinical outcomes: an international multicenter) registry study.[3] Moreover, a large prospective trial recent reported that the majority of cardiovascular events occurred among patients with non-obstructive CAD.[4]

Coronary computed tomography angiography (CCTA) enables non-invasive detection of coronary atherosclerosis and obstructive coronary artery disease (CAD). Having high negative predictive value, coronary CTA has rapidly become a widely used method for ruling out obstructive CAD in patients with intermediate pretest probability of CAD.[5] However, coronary CTA cannot directly assess the hemodynamic significance of the detected stenoses,5[,6] which may result in increased utilization of downstream diagnostic testing, particularly invasive coronary angiography.[7]

Previous studies have suggested superior diagnostic accuracy of coronary CTA combined with myocardial perfusion imaging (MPI) to detect obstructive CAD as compared to either technique alone.[8] Consequently, a Class IIa indication for the detection of obstructive CAD was granted for combined or hybrid imaging approach in the recent revascularization guidelines of the European Society of Cardiology.[9] However, the evidence about the optimal use of multimodality and hybrid imaging in routine clinical practice is currently limited.

Prognosis with a normal coronary CTA scan is excellent while the presence of extensive obstructive or nonobstructive coronary atherosclerosis on coronary CTA predicts increased risk of death and adverse cardiovascular events.[10,11] Similarly, patients with normal myocardial perfusion have good prognosis while myocardial ischemia is associated with cardiovascular events .[12] Previous studies have also demonstrated the incremental prognostic value of the combined assessment of anatomy by coronary CTA and function by single-photon emission computed tomography (SPECT) MPI, with the highest event risk related to the presence of both anatomical stenosis and abnormal perfusion.[13,14] However, the prognostic value of the hybrid imaging in routine clinical practice, where MPI is only selectively applied to patients with suspected obstructive CAD on coronary CTA, is currently unknown.

To find prognostic value of coronary CT angiography in our hospital in suspected patients with intermediate probability of CAD. Given the high negative predictive value and low cardiovascular risk associated with normal coronary CTA or MPI. In this strategy coronary CTA is first performed to exclude obstructive CAD. If suspected obstructive stenosis is present on the initial analysis of coronary CTA images, the hemodynamic significance of the stenosis is evaluated with PET perfusion study in the same imaging session.

Material & Methods:

The present study was conducted in the Department of Radiodiagnosis and Department of LARI Cardiology, King George Medical University, G.M. and A.H., Lucknow, U.P. Between August 2014 to July 2015, 50 patients underwent CCTA, and those coronary artery disease in CCTA were subjected to ICA at King George Medical University, Lucknow. In these study 50 consecutive patients with chest pain, heaviness in chest, loss of consciousness was included between August 2014 and July 2015.Age range 34-76 years, 20 women and 30 males. The heart rate range during CCTA was 55 to 75 beats per minute. Patients of all age groups, both sexes, referred for C.T. angiography, having acute chest pain with suspected coronary artery disease, from the Department of Radiodiagnosis and Department of LARI Cardiology, were included in this study. Any patient with unstable, symptoms where the requirement for ICA was considered urgent was excluded. Other exclusion criteria relating to patient safety were documented iodine contrast allergy, hyperthyroidism, significant renal dysfunction (defined as serum creatinine > 150 mmol/l or > 120 mmol/l in a diabetic patient or <30ml/min) and suspected pregnancy, previous coronary artery bypass surgery.

All CT scans in study were performed by using a 64-row CT scanner (PHILIPS Brilliance ™ CT, NETHERLAND) with ECG prospective technique. After initial frontal dual scout images (at 90 degree and 180 degree), a preliminary non-enhanced data set was acquired to calculate the calcium score and to optimize the field of view for the CTA. 40 x 0.625 mm collimation, 120 kV tube voltage and 55 m As tube current were used. The data in the contrast enhanced studies, both in sequential and spiral modes, were collected by using the following parameters: 64 x 0.625 mm collimation, gantry rotation time of 350 msec, tube voltage of 100-120 kV and 600-750 m As tube current both depending on patient size. In the sequential mode, the pitch was always 1.0 with 5 mm overlap between the slice stacks. Prospective ECG triggering determined the center of the acquisition (end diastole, 75% of the cycle) while the width of this window was set between 100 and 200 ms according to HR.

MDCT-CAs was reported according to the 17-segment model of the AHA. Each coronary *segment* was analyzed visually, and the degree of stenosis was defined by consensus between the radiologists. Lesions with a visually estimated lumen diameter reduction of more than 50% were defined as “significant stenosis”, otherwise the segment was classified as “no stenosis” or “non-diagnostic”. At the *vessel* and *patient* level, CCTA was interpreted as:

- No stenosis - all segments interpretable and no stenosis detected
- Significant stenosis - at least one stenosis, despite of non-diagnostic segments
- Non-diagnostic - no stenosis but at least one segment non-interpretable

Image quality was classified in each segment as:
• Excellent - no artifacts, unrestricted interpretation
• Adequate - moderate artifacts, acceptable for clinical diagnosis
• Poor/non-interpretable - severe artifacts impairing accurate evaluation

Statistical Analysis:
Data was assessed by using Statistical Package for the Social Sciences (SPSS) version 20.0 for Windows. The number of cases in each patients their percentages was tabulated. Cohen's kappa was used to assess the agreement between the imaging modality with respect to the presence or absence of artery stenosis and the number of stenosisverified MDCT Findings. Cohen's kappa value with respect to detection and number of detected ICA was k = 1 (% of agreement = 100%). Sensitivity, specificity, positive predictive value, and negative predictive value of was calculated by using MDCT ICA as gold standard.

Results/ Observation:
Age of patients ranged from 34 to 76 years with a mean age of 47.44±10.48 years. Majority of patients (n=29; 58%) were aged 40 to 59 years. There were 15 (30%) patients aged 30-39 years. A total of 3 (6%) patients each were aged 60-69 years and ≥70 years. Out of 50 patients enrolled in the study, a total of 30 (60%) were males and remaining 20 (40%) were female. Male to female ratio of the study subjects was 1.5:1. Majority of patients (n=32; 64%) had presence of one or more risk factors. Among different risk factors hypertension (46%) was the most common followed by hyperlipidemia (36%), diabetes (36%) and obesity (16%). A total of 18 (36%) patients did not have report with any of these risk factors. Acute chest pain was the most common clinical symptom seen in 40 (80%) cases. Heaviness in chest was reported by 29 (58%) of cases. All the patients were conscious at the time of arrival [Table 1].
All the cases had two vessel disease. Anomaly of origin and course was observed in 3 (6%) and anomaly of course was observed in 5 (10%) cases. Right Dominant circulation was seen in 45 (90%) cases. In 4 (8%) cases, circulation was left dominant. In 1 (2%) case co-dominant circulation was seen[Table 2].
A total of 850 segments were evaluated, of these 749 (88.1%) were found to be normal. Mild stenosis was observed in 50 (5.9%) cases, moderate in 29 (3.4%) and severe in 7 (0.8%). A total of 15 (1.8%) were non-evaluable. Maximum number of unevaluable segments for a branch were observed for right coronary artery (RCA) distal segment and PDA (n=4; 8% each). The normality rate was maximum for OM1 and OM2 where 49/50 (98%) cases showed normal findings. Minimal normal findings were observed at LAD-proximal location where only 40/50 (80%) cases had normal findings. RCA-middle segment had maximum proportion of cases with moderate to severe stenosis (n=8/49; 16.3%). Mild stenosis was less common at RCA – proximal and middle and D1 segments where none of the patients had mild stenosis [Table 3].
Out of 850 segments assessed through conventional coronary angiography, a total of 44 (5.2%) segments were non-evaluable, 731 (86%) were normal, 40 (4.7%) had mild stenosis, 25 (2.9%) moderate and 10 (1.2%) had severe stenosis. Maximum number of non-evaluable segments were at PDA and PLVB (n=10; 20% each) followed by RCA-distal (n=9; 18%), RCA middle (n=6; 12%) and RCA-proximal (n=3; 6%). For LCX-Middle, LCX-Distal, OM1, OM2, OM3 and LAD-Distal – there was one non-evaluable segment each. Maximum proportion of evaluable segments showing abnormality were observed for LCX-Middle, where 11/49 (22.4%) segments had abnormality. Maximum proportion of cases with moderate to severe abnormality were seen for LAD-Distal where 7/49 (14.3%) had moderate to severe abnormality [Table 4].
Overall, verification of MDCT findings could be done in 805 segments (after excluding the non-evaluable segments of both sides). Out of this conventional angiography diagnosed abnormalities in 77 segments (66 True positive and 11 false negative) whereas MDCT diagnosed abnormalities at 81 segments (66 True positive and 15 false positive). Conventional angiography ruled out abnormalities in 729 segments (714 True negative and 15 false positive) whereas MDCT angiography ruled out abnormalities in 725 segments (714 True negative and 11 false negative). There was an agreement between two techniques on 780 (715 True negative and 66 True positive) out of 805 segments, thus showing an agreement on 96.9% segments. Out of 77 cases diagnosed as positive by conventional angiography, MDCT could diagnose only 66, thus showing a sensitivity of 85.7%. Out of 729 cases diagnosed as normal by conventional angiography, a total of 714 were also diagnosed as normal by MDCT, thus showing a specificity of 97.9%. Thus, MDCT over-diagnosed abnormalities in 11 out of 77 cases diagnosed positive by it, thus showing its positive predictive value to be 81.5% whereas 714 out of 725 cases diagnosed as negative by MDCT,

only 714 were negative, thus showing its negative predictive value to be 98.5%. Overall agreement between two techniques was 96.9% [Table 5].

Taking conventional angiography as the gold standard, MDCT showed to be 89.5% sensitive and 89.7% specificity in diagnosing coronary artery disease. It had a positive predictive value of 85% and a negative predictive value of 92.9%. MDCT showed an accuracy rate of 89.6% [table 6].

Table 1: Studied Patients Characteristics

Variables		Frequency (n=50)	Percentage
Age Group (Years)	30-39 Years	15	30.0%
	40-49 Years	13	26.0%
	50-59 Years	16	32.0%
	60-69 Years	3	6.0%
	70 Years or above	3	6.0%
Mean Age±SD (Range) in years		47.44±10.48 (34-76)	
Gender	Female	20	40.0%
	Male	30	60.0%
Risk factors	Obesity	8	16.0%
	Hypertension	23	46.0%
	Diabetes	14	28.0%
	Hyperlipidemia	18	36.0%
	No risk factor	18	36.0%
	Smoking	15	30.%
Clinical Symptoms	Acute chest pain	40	80.0%
	Heaviness in chest	29	58.0%
	Loss of consciousness	0	0.0%

Table 2: MDCT Findings of Coronary Artery

	Finding	Frequency (n=50)	Percentage
Coronary anatomy	Two vessels	50	100.0%
	Anomalous origin and course	3	6.0%
	Anomalous course	5	10.0%
Dominant circulation	Right	45	90.0%
	Left	4	8.0%
	Co-dominant (Co)	1	2.0%

Table 3: Grade of Stenosis for Different Arteries as diagnosed by MDCT

Finding	Normal		Mild		Moderate		Severe		NE*	
	No.	%	No.	%	No.	%	No.	%	No.	%
RCA – Proximal	47	94	0	0	2	4	1	2	0	0
RCA – Middle	41	82	0	0	4	8	4	8	1	2
RCA – Distal	40	80	3	6	3	6	0	0	4	8
PDA	44	88	2	4	0	0	0	0	4	8
PLVB	46	92	1	2	0	0	0	0	3	6
LM	46	92	2	4	2	4	0	0	0	0
LCX – Proximal	44	88	4	8	1	2	0	0	0	0
LCX – Middle	41	82	8	16	1	2	0	0	0	0
LCX – Distal	45	90	3	6	2	4	0	0	0	0
OM1	49	98	1	2	0	0	0	0	0	0
OM2	49	98	1	2	0	0	0	0	0	0
OM3	45	90	5	10	0	0	0	0	0	0
LAD – Proximal	40	80	7	14	3	6	0	0	0	0
LAD – Middle	42	84	4	8	3	6	1	2	0	0

Finding	Normal		Mild		Moderate		Severe		NE*	
	No.	%	No.	%	No.	%	No.	%	No.	%
LAD – Distal	40	80	4	8	5	10	0	0	1	2
D1	47	94	0	0	2	4	0	0	1	2
D2	42	84	5	10	1	2	1	2	1	2
	749	88.1	50	5.9	29	3.4	7	0.8	15	1.8

Table 4: Conventional Angiography Findings

Finding	Normal		Mild		Moderate		Severe		NE*	
	No.	%	No.	%	No.	%	No.	%	No.	%
RCA – Proximal	44	88	0	0	1	2	2	4	3	6
RCA – Middle	38	76	2	4	1	2	3	6	6	12
RCA – Distal	33	66	6	12	1	2	1	2	9	18
PDA	40	80	0	0	0	0	0	0	10	20
PLVB	40	80	0	0	0	0	0	0	10	20
LM	45	90	3	6	2	4	0	0	0	0
LCX – Proximal	47	94	2	4	0	0	1	2	0	0
LCX – Middle	38	76	9	18	2	4	0	0	1	2
LCX – Distal	46	92	2	4	1	2	0	0	1	2
OM1	48	96	1	2	0	0	0	0	1	2
OM2	49	98	0	0	0	0	0	0	1	2
OM3	45	90	4	8	0	0	0	0	1	2
LAD – Proximal	43	86	3	6	4	8	0	0	0	0
LAD – Middle	42	84	2	4	5	10	1	2	0	0
LAD – Distal	40	80	2	4	5	10	2	4	1	2
D1	49	98	1	2	0	0	0	0	0	0
D2	44	88	3	6	3	6	0	0	0	0
	731	86.0	40	4.7	25	2.9	10	1.2	44	5.2

Table 5: Summarized Findings of ICA Verified MDCT Findings

	Total Verified	TP	TN	FP	FN	Agree-ment	Sens	Spec	PPV	NPV
RCA-Proximal	47	3	44	0	0	100.0	100.0	100.0	100.0	100.0
RCA-Middle	44	5	37	1	1	95.5	83.3	97.4	83.3	97.4
RCA-Distal	41	6	33	0	2	95.1	75.0	100.0	100.0	94.3
PDA	40	0	40	0	0	100.0	-	100.0	-	100.0
PLVB	40	0	40	0	0	100.0	-	100.0	-	100.0
LCA	50	4	45	0	1	98.0	80.0	100.0	100.0	97.8
LCX-Proximal	50	3	45	2	0	96.0	100.0	95.7	60.0	100.0
LCX-Middle	49	8	38	0	3	93.9	72.7	100.0	100.0	92.7
LCX-Distal	49	3	44	2	0	95.9	100.0	95.7	60.0	100.0
OM1	49	1	48	0	0	100.0	100.0	100.0	100.0	100.0
OM2	49	0	48	1	0	98.0	-	98.0	0.0	100.0
OM3	50	5	45	0	0	100.0	100.0	100.0	100.0	100.0
LAD-Proximal	50	7	40	3	0	94.0	100.0	93.0	70.0	100.0
LAD-Middle	50	8	41	1	1	98.0	88.9	97.6	88.9	97.6

LAD-Distal	49	6	37	3	3	87.8	66.7	92.5	66.7	92.5
D1	49	1	47	1	0	98.0	100.0	97.9	50.0	100.0
D2	49	6	42	1	0	98.0	100.0	97.7	85.7	100.0
Total	**805**	**66**	**714**	**15**	**11**	**96.9**	**85.7**	**97.9**	**81.5**	**98.5**

Table 6: Diagnostic Efficacy of MDCT with respect to Conventional Angiography for detection of abnormalities (n=48)

MDCT	**Conventional Angiography**		**Total**
	Positive	**Negative**	
Positive	17	3	20
Negative	2	26	28
Total	19	29	48

Sensitivity	**Specificity**	**PPV**	**NPV**	**Accuracy**
89.5	89.7	85.0	92.9	89.6

Discussion

The study group comprised of 30 males (60%) and 20 females (40%). Mean age of the study group being 47.44 years. The highest number of patients was in the age group of 40- 59 years (58%). The study done by Budoff et al[15] comprised of 230 patients of which 136 were male (59.1%) with a mean age of 57 ± 10 years and that done by Raff GL et al[16] had 53/70 males (73%) with a mean age of 59 ± 11 years with a range of 22 to 81 years. Our result showed slightly more male predominance which may reflect either a selection bias or small study size. However, our study has shown an increased incidence of disease as the age advances which are in accordance with the previous studies.

In our study cases majority of patients (64%) had presence of one or more risk factors. In which hypertension (46%) was the most common risk factors followed by hyperlipidemia (36%), diabetes (36%) and obesity (16%). A total of 18 (36%) patients did not have report with any of these risk factors. Acute chest pain was the most common clinical symptom seen in 40 (80%) cases. Heaviness in chest was reported by 29 (58%) of cases. All the patients were conscious at the time of arrival.

Coronary artery aneurysms and ectasia are characterized by an abnormal dilatation of a coronary artery. Coronary aneurysms and ectasia are usually considered as rare findings; however, with the advent of coronary multidetector computed tomographic (CT) angiography, they are more frequently seen as incidental findings in many entities, and their morphologic features. Coronary artery aneurysms are generally classified as saccular or fusiform on the basis of their morphologic appearance. In saccular aneurysms, the transverse diameter is greater than the longitudinal measurement of the aneurysm, whereas in fusiform aneurysms, the longitudinal measurement is greater than the transverse diameter. Saccular aneurysms are frequently seen distal to an area of proximal stenosis and are often multi-segmental, and are more prone to thrombosis and rupture.[17]

In our study, a total of 850 coronary artery segments in 50 patients suspected of coronary artery disease were assessed by both coronary CT angiography and catheter angiography. Segments were classified according SCCT Coronary Segmentation[111] which is modified version American heart association (AHA) 17 segment model. All segments regardless of size were included in the study.

Out of 850 segments 805 segments could be evaluated by catheter angiography due to near total occlusion in few of the segments beyond which catheter cannot be passed. In two of the patients RCA could not be evaluated as it could not be catheterized because of acute angulation in their course. In two of the case RCA was originating from left coronary sinus. So out of 850 segments, 835 and 805 segments were evaluated in MDCT and catheter angiography respectively .835 (98.23%) out of 850 segments were assessable by CCTA, making 1.7% of segments as non-evaluable segments. overall, verification of MDCT findings could be done in 805 segments after excluding non-evaluable segments. The non evaluable segments were either due to near total occlusion or abnormal course of coronary artery segments. Most of other segments rendered non evaluable were due to small size and slight motion blur. In previous studies using 16- and 32- slice MDCT, the percentage of non-evaluable segments has been reported to vary between 7- 22%.[18] Robustness of use thus seems to have markedly improved with further technical development. 64 slice MDCT, in comparison to16-slice MDCT, provides an increased number of sections per gantry half-rotation (i.e, 64 vs 16) which translates into shorter scan times and superior temporal resolution. As well as in our study only those patients were included who had a regular heart rate of ≤ 65 which was also a reason for high number of evaluable segments. The diagnostic accuracy of CCTA for non-invasive detection of coronary artery stenosis has been an area of active research with the number of papers being published in this field increasing year by year. A total of 74 lesions were detected out of 805 segments on catheter angiography, of these 40 were non-significant and the rest 34 were significant. However, on coronary CT angiography a total of 83 lesions were detected, out of 83 lesions 49 were non-significant and rest 34 were significant. All the non-evaluable segments were considered as normal while analysing the data. 11 lesions were missed on CT angiography which was found to be significant on invasive angiography. 15 lesions were overestimated on CT angiography. 11 segments of significant stenosis which were missed on CT coronary angiography on retrospective analysis either had small vessel size, tortuous course, and poor opacification due to proximal near total occlusion of artery or motion blur. All of them were considered as false negatives. 15 lesions were overestimated on coronary CT angiography were considered false positive. Out of the 15 lesions 10 were due to overestimation of stenosis because of heavily calcified plaque. A total of 66 segments were true positive and the remaining 714 segments were true negatives. On per segment basis analysis, CT coronary angiography on 64 slice Philips scanner had an overall diagnostic, sensitivity, specificity, PPV and NPV obtained in our study on vessel-based analysis were 85.7%, 97.9%, 81.5% and 98.5% respectively with invasive catheter angiography as gold standard.

The vessels included for analysis are RCA, LAD, LCx and LMCA (left main coronary artery). Overall diagnostic accuracy of 89.6%, sensitivity of 89.5%, specificity of 89.7%, positive predictive value of 85% and negative predictive value of 92.9% were found in MDCT with invasive catheter angiography as gold standard. Number of cases having significant stenosis involving RCA, LAD, LCX and LM as per CAG and CCTA were 7, 13, 4, 2 and 11, 11, 3, 2 respectively. Discrete differences in sensitivity and specificity were observed for the RCA, LAD, LCX and LMCA arteries. In previous studies using 16-slice MDCT, sensitivity has been reported to vary from 85-97% and specificity between 87-99%. Mariko Ehara, et al[19] demonstrated the average sensitivity of CTA to diagnose significant stenosis was 90%, specificity 94%, positive predictive value (PPV) 89% and negative predictive value (NPV) 95% of 64 slice MDCT. The results of our study are in accordance with study carried out by Mariko Ehara et al[19]studied 69 patients who underwent both 64 slice CT and CAG and emphasized the high diagnostic accuracy of 64 slice MDCT in the assessment of significant CAD per patient and per segment in a non-selected patient population with a high prevalence of CAD. Of a total 966 segments, 884 (92%) were assessable. Their analysis yielded an overall sensitivity, specificity, PPV and NPV of 90%, 94%, 89%, and 95%, respectively. In our study we reported good correlation between CCTA and CAG for grading of coronary artery stenosis on a per-segment basis. All the coronary segments irrespective of their diameter were included. Patients with irregular pulse rate and those having heart rate ≥ 70 bpm were not included. As few of the patients received sublingual nitroglycerine that might have resulted in a greater number of assessable segments and better visualization of branched vessels and smaller segments.[20] However, the accuracy was better in the main arteries compared to the smaller branch vessels. The poor result in few vessels could be attributed to small vessel size.

Raff GL et al[16] found specificity, sensitivity, and positive and negative predictive values for the presence of significant stenosis on 64 slice MDCT scanner were: by segment (n = 935), 86%, 95%, 66%, and 98%, respectively and by artery were (n = 279), 91%, 92%, 80%, and 97%, respectively.

The results of our study were found to be in accordance with those of 40 slice and 64 slice scanner and were better than those of 16 slice scanners. This shows that with controlled regular heart rate, good breath holding capability and sublingual nitroglycerine at the time of scan, 64 slice MDCT scanner shows comparable results with other center studies done in 64 slice MDCT.

Four cases of complete occlusion of RCA were seen in which length of plaque and status of distal vessel was not assessable on catheter angiography. CT angiography helped in calculating the length of block. Mollet et al[21] also reported that in patients with total occlusion, occlusion length and degree of calcification as assessed by CT are more accurate predictors of interventional success than are angiographic parameters. Accurate detection of left ventricular volumes and EF is fundamental for the diagnosis, prognosis and follow-up of many different forms of cardiovascular disease. Due to its particular advantages, echocardiography is the most widely used imaging technique for this purpose. It is an easily available bedside method that is also cheap, fast and noninvasive.

Limitation of our study

A limitation of our study was that all patients were referred for CAG. Thus, there was a high incidence of true disease, which tends to increase the sensitivity and PPV. Patient selection bias thus limits the direct transfer of these results into clinical practice in populations not undergoing catheterization. However, a high pretest probability of CAD in a clinical study is per se inevitable, since performance of reference CAG is not ethically acceptable in asymptomatic, low pretest probability patients. Since our study group size was a small one enrolling 50 patients at a single centre, the findings may not reflect readings of other centres. Hence, further studies with larger patient population, preferably in a multicentre setting appears desirable to draw definite conclusions.

Conclusion:

In comparison to catheter / invasive coronary angiography (gold standard), we found the overall specificity of MDCT coronary angiography in detecting coronary artery disease is 89.7%, with sensitivity in the range of 89.5%. There is fair agreement between the MDCT and catheter angiography for detecting the significant stenosis in coronary arteries.Because of improved high temporal and spatial resolution MDCT provides the better detail of coronary anatomy and disease correlation of the patient. MDCT has got high NPV (approx.=92.9%) so it almost rules out CAD as the existing cause of acute chest pain and prevents unnecessary invasive catheterisation of patients.

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