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TO ASSESS AMOUNT OF CALCIUM IN HIGH RISK PATIENTS OF STRATIFICATION IN ASYMPTOMATIC & SYMPTOMATIC BY NON CONTRAST CT CALCIUM SCORING

Dr. Mahesh Verma[1] (Assoc. Prof.), Dr. Renu Goindani[2] (Assoc. Prof.) & Dr. Sheetal Singh[3] (Professor)
Dept. of Radio diagnosis, Index Medical College Hospital & Research Centre, Indore[1&3] (M.P.)
Dept. of Radio diagnosis, Amaltas Institute of Medical Sciences, Dewas[2] (M.P.)

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Corresponding author: Dr. Renu Goindani
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Abstract
Background & Method: A detailed clinical history was elicited in all patients. The presenting complaints included the duration & severity of chest pain. Associated history of diabetes, hypertension, smoking or family history of coronary artery disease were noted, specific note of menstrual history was made wherever indicated. Routine and other relevant laboratory investigations were done in all cases. Non enhanced CT coronary artery calcium scoring will be performed after taking patient's informed consent.
Result: Calcium scores between asymptomatic and symptomatic groups. Mean ± SD of calcium scores in asymptomatic and symptomatic groups were 78.58 ± 83.14 and 295.18 ± 106.97, respectively. Minimum and maximum values of calcium score in asymptomatic group were 0.00 and 310.00 and; in symptomatic group were 90.00 and 442.00. Mann-Whitney U test showed that calcium score in symptomatic group were significantly higher than asymptomatic group (MW = 191.700, P <0.001).
Conclusion: The benefit of calcium scoring is having a better understanding of the relative risk of having a cardiac event or stroke in the future and using that information to decide which strategies to adopt to reduce risk if the risk is found to be high.
Keywords: Calcium, CT, Stratification & Asymptomatic & Symptomatic.
Study Designed: Observational Study.

Introduction:

A screening modality such as a simple non–contrast enhanced, or non-contrast, computed tomographic (CT) detection of coronary artery calcium (CAC) improves the ability to accurately predict risk in vulnerable groups and ads information above and beyond global risk assessment as shown by the recent Multi-Ethnic Study of Atherosclerosis[1].

CAC scores were first quantified by means of EBT; however, with the rapid development of multi-detector CT, CT has become the most frequently used modality to assess the extent and severity of underlying coronary calcification[2]. Neither modality requires intravenous contrast material to determine CAC. In general, EBT used a unique technology enabling ultrafast scan acquisition times in the thin-section, single-section mode with continuous, non-overlapping sections of 3-mm thickness and an acquisition time of 100 msec in a prospective gated manner[3]. Electrocardiographic (ECG) triggering is used during end systole or early diastole determined from continuous ECG tracing during the scan. Historically, the most common exposure time is at 80% of the R-R interval[4]. However it is important to note that EBT scanners are no longer produced and almost all of CAC testing currently is performed with multi-detector CT scanners. The current generation of multi-detector CT systems is capable of acquiring up to 128–320 sections of the heart simultaneously with ECG gating in either a prospective or retrospective mode. Coronary calcification is determined in the axial mode by using prospective ECG triggering at a predetermined offset from the ECG-detected R wave. On contrast cardiac CT images, CAC is defined as a hyper attenuated lesion above a threshold of 130 HU with an area of three or more adjacent pixels. There are currently two CT calcium scoring systems widely used: the original Agatston method and the volume scoring method developed by Callister et al[5]. However, it has been demonstrated that there appears to be an excellent correlation between the two scoring methods, and they show similar characterization when applied properly[6]. Both methods calculate lesion specific scores within the left main, left circumflex, left anterior descending, and right coronary arteries and provide total scores for each artery and a sum total across all four arteries.

Material & Method

The present study was conducted in the Department of Radio-diagnosis at Index Medical College Hospital & Research Centre, Indore during the period of July 2018 to

May 2019. All 150 Patients included in study referred to the Department of radio-diagnosis for CT chest was studied.

INCLUSION CRITERIA

- All patients more than 40 years reporting in the department with history of chest pain consenting to be part of the study. (Included in symptomatic patients)
- All patients more than 40 years with no history of chest pain came for CT Chest having any history of diabetes or history of hypertension, smoking and high lipid profile or a positive family history of coronary artery disease. (will be included in asymptomatic high risk patients)

EXCLUSION CRITERIA

- All patients less than 40 years reporting in the department with history of chest pain.
- Pregnant women.
- Patients and/ or his/her legally acceptable representative NOT willing to provide their written informed consent for participation in the study.

A detailed clinical history was elicited in all patients. The presenting complaints included the duration & severity of chest pain. Associated history of diabetes, hypertension, smoking or family history of coronary artery disease were noted, specific note of menstrual history was made wherever indicated. Routine and other relevant laboratory investigations were done in all cases. Non enhanced CT coronary artery calcium scoring will be performed after taking patient's informed consent.

Results

Table 1: Age distribution of study subjects in asymptomatic and symptomatic groups.

Groups	Age groups				Total n (%)
	41-50 years n (%)	51-60 years n (%)	61-70 years n (%)	>70 years n (%)	
Asymptomatic	18 (24.00)	21 (28.00)	17 (22.66)	19 (25.34)	75 (100.00)
Symptomatic	16 (21.33)	19 (25.33)	21 (28.00)	19 (25.34)	75 (100.00)
Chi-square test	χ^2 = 0.627, df = 3, P = 0.736 (>0.05), Not significant				

Age distribution of study subjects in asymptomatic and symptomatic groups. In both, asymptomatic and symptomatic groups there were 75 subjects. In asymptomatic group, there were 18 (24.00%), 21 (28.00%), 17 (22.66%) and 16 (25.34%) subjects in 41-50 years, 51-60 years, 61-70 years and more than 70 years age groups respectively. Whereas in symptomatic group, there were 16 (21.33%), 19 (25.33%), 21 (28.00%) and 19 (25.34%) subjects in 41-50 years, 51-60 years, 61-70 years and more than 70 years age groups respectively. Chi-square test showed was no significant difference for age distribution of study subjects in asymptomatic and symptomatic groups (χ^2 = 0.6279, df = 3, P >0.05). Asymptomatic and symptomatic groups were same with respect to age distribution.

Table 2: Comparison of calcium scores between asymptomatic and symptomatic groups.

Groups	Calcium score	
	Mean ± SD	Min-Max
Asymptomatic	78.58 ± 83.14	0.00-310.00
Symptomatic	295.18 ± 106.97	90.00-442.00
Mann-Whitney U test	MW = 191.700, P = 0.000 (<0.001), Very high significant	

Calcium scores between asymptomatic and symptomatic groups. Mean ± SD of calcium scores in asymptomatic and symptomatic groups were 78.58 ± 83.14 and 295.18 ± 106.97, respectively. Minimum and maximum values of calcium score in asymptomatic group were 0.00 and 310.00 and; in symptomatic group were 90.00 and 442.00. Mann-Whitney U test showed that calcium score in symptomatic group were significantly higher than asymptomatic group (MW = 191.700, P <0.001).

Discussion

The presence of coronary calcifications have been proven to be an important prognostic indicator and link to increased mortality[7].They can also provide significant information that can be used in the clinical setting when assessing future risk. Perhaps this additional information may be useful by allowing earlier detection and prevention of more serious heart conditions. The use of CT in the detection of calcifications has been thoroughly documented and universally accepted as a highly accurate tool. The high sensitivity range makes it a practical tool for detection[4,8].

Comparison of calcium scores between asymptomatic & symptomatic patients

Calcium score in symptomatic group was significantly higher than asymptomatic group. Concurrently Nicoll et al(2016)[9] reported that in symptomatic patients, the calcium score is a more accurate predictor of significant coronary stenosis than conventional risk factors.

Conclusion

The benefit of calcium scoring is having a better understanding of the relative risk of having a cardiac event or stroke in the future and using that information to decide which strategies to adopt to reduce risk if the risk is found to be high.

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