MSD

Medical Science and Discovery
ISSN: 2148-6832

Evaluation of coronary arteries stenosis by computed tomography angiography in district Faisalabad

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ABSTRACT

Objective: This study was conducted to investigate the accuracy and precision of computed tomography angiography for assessing significant coronary artery stenosis in district Faisalabad.

Materials and Methods: The data was collected from the Radiology department of Shifa International hospital Faisalabad. Sixty patients (40-80 years of age) were assessed through computed tomography to evaluate coronary heart disease. Data was collected by using a close-ended self-modified questionnaire and analyzed by SPSS V22.

Results: The findings of this study showed that the incidence of coronary heart disease patients was 34 (56.67%) out of 60. Among the affected patients, 39 (65%) were male, and 21 (35%) were female. Based on the evaluation, most of the affected patients were under (50-60) years of age. The percentage of coronary arteries stenosis varies as the left anterior-descending artery LAD had higher stenosis (41.67%) among others; left main LM (16.67%), left-circumflex artery LCX (20%), and right-coronary artery RCA (21.67%) in all affected patients.

Conclusion: It was presumed that computed tomography angiography precisely distinguishes the presence and finding of coronary stenosis and was additionally pronounced the best quality level. Based on coronary arteries, stenosis of LAD was the most commonly reported in diseased patients. Other arteries stenosis can also increase the risk of CHD in patients.

Keywords: Coronary heart diseases, Coronary artery stenosis, Computed tomography angiography, Left anterior descending artery, Acute coronary syndrome

INTRODUCTION

Coronary heart disease: Coronary heart disease is one of the grave health issues in our society (1). In the United States, CHD is the leading cause of death and about a third of all deaths among persons over the age of 35. Mortality from CHD was expected to continue to rise in the developing world (2). For coronary artery disease imaging, Computed Tomography Angiography (CTA) has been the first and most progressive application (3).

Coronary heart disease is regarded as the result of occlusive vessels due to lipid deposition, while an increase in plasma cholesterol became the risk factor (4). The prevalence of CHD in developed countries among the elderly (29-59) declined from 42% to 32% among men and from 29% to 16% among women, while no change from age 60 or older, however, with a decrease in the incidence of coronary artery disease (2). For diagnosis, the CT acquisition modality is advantageous for CHD assessment, including myocardial viability, myocardial perfusion, coronary angiography, and ventricular function assessment (5).

Atherosclerosis plaques result in acute coronary syndrome (ACS) that leads from mild coronary stenosis to adverse cardiovascular events (6). In asymptomatic patients, myocardial infarction is the first clinical presentation of coronary heart disease and leads to myocardial necrosis which is caused by unstable ischemic syndrome (7, 8). The disruption of plaques as a solid state produces thrombosis that persuades ACS (14, 15).

Coronary stenosis is the narrowing of the arteries, and the study is meaningful for the progression of coronary artery disease (9). The commonness of coronary conduit stenosis is around 5% in patients with constant angina, around 7% in patients with intense myocardial dead tissue (AMI), and around 9% in patients with sidestepping a medical procedure (10). Multi-slice computed tomography, coronary angiography is an excellent approach to safe coronary angiography for finding and evaluating coronary stenosis (11). Coronary CT Angiography is important for detecting coronary stenosis and plaque (1).

Research Article

Received 26-10-2022

Accepted 16-11-2022

Available Online: 17-11-2022

Published 30-11-2022

http://dx.doi.org/10.36472/msd.v9i11.834

The risk of lifelong coronary heart disease is 1/3 for women and 1/2 for men at all ages (12). Overall, 23% of patients undergo angiography, and 6% of patients who have had a myocardial infarction do not know the cause of CAD (13). In recent decades, the pathophysiology of CAD has developed exceptionally well. Patients generally typically show up with acute or chronic exemplification (7).

For diagnosis, CT coronary angiography continues to provide the highest level of accuracy for locating a coronary disease (16). The coronary computed tomography angiography (CTA) technique is a reliable, safe, and symptomatic tool for evaluating individuals with coronary conduit illness (17).

CT Coronary Angiography: It appears that CTA is a fascinating, risk-free, and excellent first-line imaging technique with the potential to obtain all measurements (18). Due to its diagnostic performance being comparable to catheter coronary angiography for individuals with CAD, coronary computed tomography angiography has recently attracted much interest (19). Every year, roughly 2.3 million coronary CT Angiography inspections and one million CT examinations are performed (18).

The majority of studies show clear condescending for cardiac CT angiography (CCTA). Regarding obstructive coronary artery disease identification, CCTA got greater approval for use in ordinary clinical practice (17). CCTA has predictive value for both all-cause mortality and critically important cardiovascular events, according to single-center studies (20, 37).

High specificity and sensitivity (greater than 90%) have been achieved with 64-slice CT for CABG, and coronary CTA also plays a vital role in the evaluation of the patency or occlusive alterations of coronary artery bypass grafts (CABG) for the diagnosis of severe stenosis (21).

Multi-slice CT's improved temporal and spatial resolution has improved the imaging of tiny structures (22). Due to the high motion velocity of the coronary arteries, the coronary CTA scanner has a greater temporal resolution (19-75 ms) to produce images of the beating heart with the least amount of motion artifact (23). However, the most recent 64-slice scanners have superior image quality (better spatial and temporal resolution) having good diagnostic validity (24, 25).

In contrast to IVUS, which has limitations, MSCT is a reliable and accurate test. Multislice computed tomography enables non-invasive evaluation of the vascular wall following contrast administration (11). MSCT has developed as a painless alternative for the assessment of coronary plaques as a result of advancements in imaging techniques. In any event, MSCT has several advantages in the diagnosis and treatment of coronary vein plaques (27).

Rationale: The rationale of our study is that limited research was conducted about the application of computed tomographic angiography to evaluate coronary heart disease in Pakistan.

MATERIAL and METHODS

Study group: A descriptive study was performed on 60 patients (39 males and 21 females) having coronary heart disease in the age group between 40 years to eighty years. In this study male to female proportion was 1:8:1.

Study design and setting: A cross-sectional study was conducted in Shifa International Hospital, Faisalabad, Pakistan, by a TOSHIBA 64-slice helical CT machine.

Data collection and analysis: Data was collected by using closed-ended self-modified performa and analyzed by using a statistical package for social science (SPSS) version 22.

Ethical issues: This study had no ethical issues because the client was not put on the experiment and no medication was given during the study. Moreover, the study was duly approved by the ethical committee of Faisal hospital, Faisalabad.

RESULTS

Sixty patients with coronary heart disease, 39 (65%) were male, and 21 (35%) were female (**Figure. 1**).

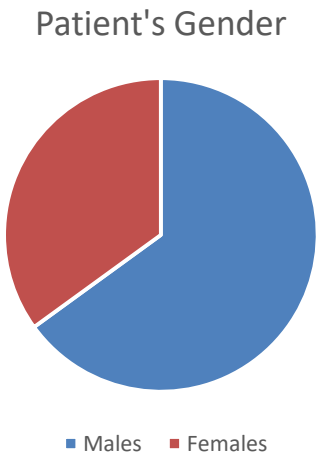

Figure 1: Distribution of Patient's Gender

Patients were categorized into four age groups; patients under 40-50 years of age were 18.33%, 50-60 years of age group about 43.33% patients, followed by 60-70 years of age group 26.67%, lastly, 70-80 years of age group patients were 11.67% (**Figure. 2**).

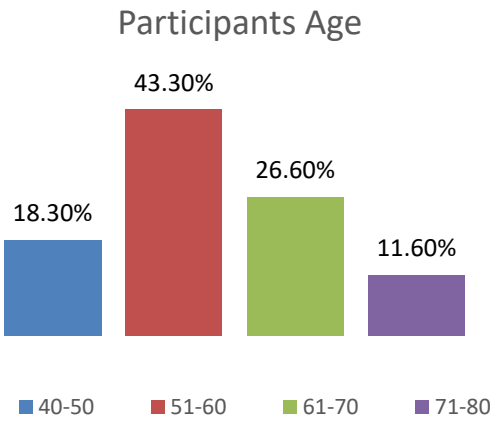

Figure 2: Frequency distribution of participant's age

http://dx.doi.org/10.36472/msd.v9i11.834

Sixty consecutive patients with coronary illness were examined, and coronary heart diseases were found in 34 (56.6%) patients (**Figure. 3**).

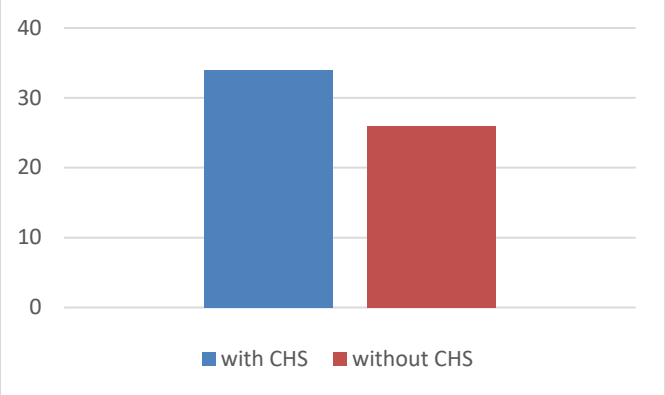

Figure 3: Distribution of patients with and without coronary heart stenosis

The stenotic coronary arteries found in our patients vary as the left anterior-descending artery LAD was 14 (41.67%), the most stenotic artery among all arteries. However, left main LM was found in 5 (16.67%) patients, left circumflex-artery LCX was found in 7 (20%) patients, and right-coronary artery RCA was found in 8 (21.67%) patients among all affected patients (**Figure. 4**).

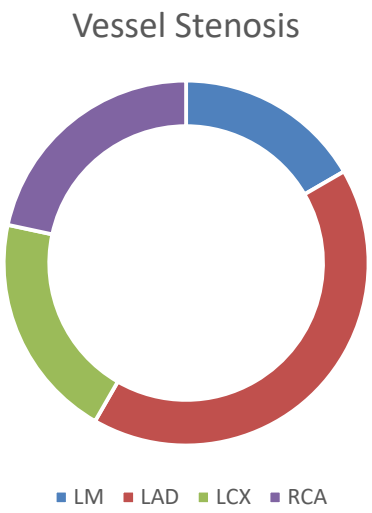

Figure 4: Coronary Vessel based analysis for stenosis by CTA

A bar chart shows calcified arteries based on calcium scoring in our coronary heart disease patients. Left main artery calcification was found in 5 (16.67%) patients, left anterior descending artery calcification was in 15 (46%) patients, left circumflex artery was in 8 (23.33%) and the right coronary artery was in 7 (20%) patients. The percentage and frequency of calcification were highest in LAD among all arteries of affected patients noted in each patient Performa (**Figure. 5**).

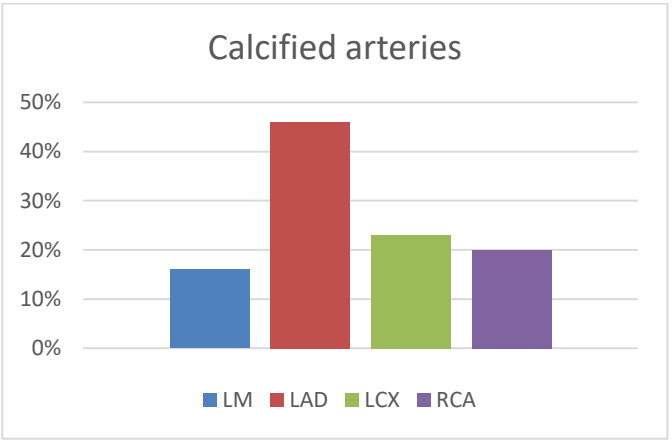

Figure 5: Calcified arteries on the basis of calcium scoring

DISCUSSION

Sixty cases were interviewed using a self-modified questionnaire or Performa. The high frequency of coronary heart disease is notable and numerous different creators have distributed research on the commonness of coronary illness and the symptomatic and diagnostic capacity of computed tomography angiography (CTA).

The estimation of the incidence of coronary heart disease in this study is quite comparable with the results of earlier and larger studies by Sebastian Leschka and his co-workers in 2005 on 67 patients; 50 male and 17 female, and observed that 47 (70%) patients were distinguished as having huge coronary artery stenosis (39).

G. Mowatt conducted a meta-analysis on coronary artery disease evaluation in 2008. According to this study's findings, 64-slice CT is extremely sensitive for diagnosing patients' substantial chest discomfort and coronary artery disease, especially when the diagnosis is unclear (16). Our survey results with 64-slice CT were quite similar to this study.

The results of our study are also closely consistent with the larger study performed by Armin Arbab Zadeh and his colleagues in 2012 on 371 consecutive patients. The consequences of their study demonstrated that 98 (28%) patients had a high frequency of coronary artery disease, while our study showed coronary heart disease in 34 (56%) patients (33).

W. Bob Meijboom and his co-workers (2008) did a prospective study on 360 symptomatic patients between 50-70 years of age. Their study reported the predominance of coronary artery illness at 68% (38). The results of our survey were quite similar to this study.

The results of our study are also closely related to an ancient and bigger study conducted by Julie M. Miller in 2008 on 291 patients. The aftereffects of their study showed that 56% of patients had the obstructive coronary-artery disease (35).

CONCLUSION

It was concluded that coronary heart disease was found in 34 (56.67%) out of 60 patients, and computed tomography angiography precisely distinguishes the presence and analysis of coronary illness and was additionally pronounced the best quality level. Based on coronary arteries, stenosis of LAD was the most commonly reported in diseased patients. Other arteries stenosis can also increase the risk of CHD in patients.

Acknowledgments: None

Conflict of interest: The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. This research did not receive and specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Author Contributions: AMK, WH: Study design, Literature review, Data collection and processing, **AMK:** Writing, Revisions

Ethical approval: All procedures performed in studies involving human participants were in accordance with the institutional and/or national research committee's ethical standards and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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