

Diagnostic reliability of cardiac CT in a population of patients undergoing coronary angiography

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ABSTRACT

This article examines the diagnostic reliability of cardiac CT in a population of patients who underwent coronary angiography after previously undergoing cardiac CT. To date, cardiac CT is considered a less invasive imaging method compared to coronary angiography, but as demonstrated, it is no less reliable from a diagnostic perspective. Specifically, the study involved a population of 100 patients who had previously undergone cardiac CT, as recommended by a cardiology specialist, and were subsequently subjected to coronary angiography after abnormalities were detected in the CT scan. The results obtained from both methods were compared by analyzing sensitivity, specificity, and diagnostic accuracy. The data were processed using various statistical methods, which ensure the results' reliability. Despite some inherent limitations of cardiac CT, such as artifacts, clinical conditions of the patient, and the necessary spatial-temporal resolution it was found that cardiac CT is considered reliable in diagnostic-therapeutic pathways and follow-up for patients with ischemic heart disease, suggesting it as a valid alternative in everyday clinical practice.

INTRODUCTION

Cardiovascular diseases are among the leading causes of morbidity and mortality worldwide, posing a significant burden on public health systems. Early and accurate diagnosis of coronary diseases is essential for timely intervention and improving clinical outcomes. In this context, Cardiac Computed Tomography (cardiac CT) has gained an increasingly important role as a non-invasive diagnostic method for evaluating coronary arteries [3]. Cardiac CT provides detailed images of cardiac structure and function, offering significant advantages over invasive techniques such as coronary angiography. However, its diagnostic reliability in terms of sensitivity, specificity, and accuracy compared to coronary angiography (considered the gold standard for diagnosing coronary artery disease) remains a subject of ongoing debate within the scientific community. This article aims to analyze the diagnostic reliability of cardiac CT in a population of patients who, after testing positive on the tomographic examination, subsequently underwent coronary angiography. Through a direct comparison between the results obtained from both techniques, key diagnostic parameters will be assessed to determine the value of cardiac CT as a diagnostic tool in clinical practice. Specifically, the goal is to assess whether cardiac CT can be considered a valid and reliable alternative to coronary angiography for the diagnosis of coronary artery disease, thereby contributing to a more personalized and less invasive

approach in the management of cardiovascular patients. The results of this research could have important clinical implications, providing new insights for optimizing diagnostic and therapeutic protocols in cardiology. In this paper, after a review of the existing literature on the two diagnostic techniques, the methodology used for the study will be presented, followed by an analysis of the results and a discussion of their clinical implications [2], [4]. The article will conclude with recommendations for future developments in research in this field.

MATERIALS AND METHODS

The aim of this study is to evaluate the diagnostic reliability of cardiac computed tomography (cardiac CT) in a sample of 100 patients. Specifically, we aim to determine the sensitivity, specificity, and diagnostic accuracy of cardiac CT in detecting significant coronary artery abnormalities. Patients who test positive on cardiac CT and are assessed by a cardiologist will subsequently undergo coronary angiography, considered the "gold standard" in evaluating coronary artery disease. The study will have a prospective and observational design, with patient enrollment at the Bonomo Hospital in Andria.

Patients will be selected based on the following inclusion criteria:

- Age between 40 and 80 years
- Symptoms suggestive of angina or atypical chest pain



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- Cardiovascular risk factors (hypertension, diabetes, smoking)

Exclusion criteria will include:

- Known allergy to the contrast agent used in cardiac CT
- Severe renal insufficiency
- Uncontrolled cardiac disorders or significant arrhythmias

All patients will undergo cardiac CT scanning according to standardized protocols, using the latest generation Siemens multidetector spiral CT scanner. Before the exam, an iodinated contrast agent will be administered and, if necessary, a beta-blocker will be given to reduce heart rate and improve image quality [6], [7]. The images will be acquired and analyzed by a team of experienced radiologists, who will perform a qualitative and quantitative assessment of the presence of coronary stenosis. Patients who test positive on cardiac CT, showing stenosis $\geq 50\%$, will undergo coronary angiography. The procedure will be performed according to standard guidelines, and the results will be used as a reference to calculate the diagnostic reliability of cardiac CT. All patients will provide informed consent before participating in the study, and confidentiality and anonymity of the collected data will be ensured.

RESULTS

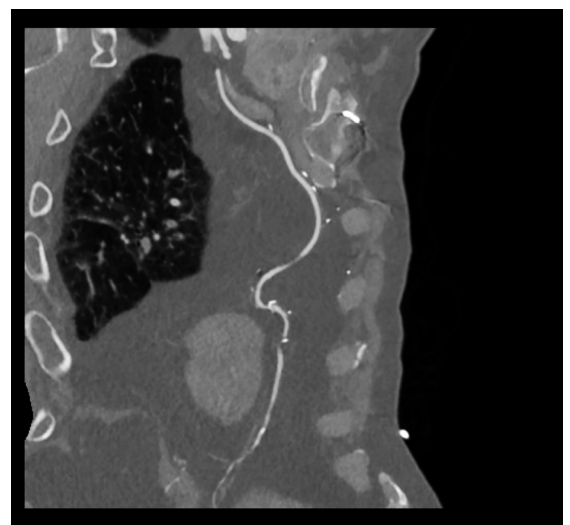
This analysis included 100 patients who underwent cardiac CT in 2023, with the aim of evaluating the incidence of coronary artery disease. Of these, 60 patients (60%) had a positive result on the tomographic examination, while 40 (40%) were judged negative. Among the 60 patients

who tested positive, the cardiologist deemed it necessary to proceed with coronary angiography for 55 patients (91.7%), while 5 patients (8.3%) did not require further interventions (Fig. 1). Among the 55 patients referred for coronary angiography, significant stenosis was confirmed in 42 cases, which corresponds to 76.4% of the total. These patients underwent angioplasty and stent placement, highlighting the need for invasive procedures in a substantial portion of the analyzed population. For 10 patients (18.2%), although stenosis was confirmed, the severity of the lesions did not justify an invasive intervention. Finally, for 3 patients (5.4%), although stenosis was confirmed, a functional study excluded the need for angioplasty due to the absence of flow compromise.

The demographic analysis revealed that the predominant age group in the sample is between 55 and 75 years, accounting for 65% of the total. Specifically, 30% belong to the 55-64 age range, and 35% belong to the 65-75 age range. Only 15% are in the 40-54 age group, while 20% are over 75. Among the positive patients, 40% (24 out of 60) are in the 65-75 age range, 34% (20 out of 60) are in the 55-64 range, 6% (4 out of 60) are in the 40-54 range, and 20% (12 out of 60) are over 75. The sex distribution of the sample showed a clear male predominance: 80 men (80%) and 20 women (20%). Among the patients who tested positive on cardiac CT, 70% (42 out of 60) were men, while 30% (18 out of 60) were women. These data indicate a higher incidence of coronary artery disease in men compared to women in the analyzed sample.



a)



b)

Figure 1. Patient with stenosis requiring coronary angiography (a) Patient with stenosis who does not require coronary angiography (b).



Table 1. This table represents the classification of patients who underwent cardiac CT.

Result	Number of patients	Percentage of patients
Positive	60	60 %
Negative	40	40 %

Table 2. This table represents the classification of patients who tested positive on cardiac CT.

Coronary angiography	Number of patients	Percentage of patients
YES	55	91,7 %
NO	5	8,3 %

Table 3. This table represents the classification of patients who underwent coronary angiography.

Clinical management	Number of patients	Percentage of patients
Angioplasty yes	42	76,4 %
Angioplasty no	10	18,2%
Functional study	3	5,4%

DISCUSSION

The main objective of this article was to assess the diagnostic reliability of cardiac CT in identifying coronary artery diseases in a sample of 100 patients. The results confirm the effectiveness of cardiac CT as a diagnostic tool, highlighting a significant incidence of coronary artery disease among the analyzed patients. Cardiac CT identified 60% of patients as positive, leading to the re-recommendation for coronary angiography for 91.7% of these subjects. This finding emphasizes not only the reliability of cardiac CT in the early diagnosis of coronary artery disease but also its clinical utility in guiding timely therapeutic decisions. The ability to effectively identify at-risk patients allows for early interventions, potentially reducing cardiovascular complications. Among the 55 patients who were recommended for coronary angiography, 76.4% showed significant stenosis, confirming the high prevalence of coronary artery disease in our sample. This result aligns with the existing literature, which highlights a correlation between positive cardiac CT results and the presence of significant coronary lesions. The ability of cardiac CT to predict the need for invasive procedures, such as angioplasty, is crucial in the clinical management of cardiac patients.

The age distribution results clearly show that the prevalence of coronary artery disease increases with age. The 55-75 age group represents 65% of the sample, and a higher incidence of stenosis was observed in patients over 65 years old. These results support the idea that age is a significant risk factor for cardiovascular diseases and underline the importance of implementing targeted screening programs for this population. Additionally, the sex distribution revealed a clear male predominance, with 70% of positive patients being men. This

observation is in line with previous studies that have shown a higher incidence of coronary artery disease in men compared to women, potentially due to genetic, hormonal, and behavioral factors. It is crucial to consider these gender differences in the context of prevention and management of heart disease to develop more personalized and effective approaches [8-10].

However, it is important to acknowledge some limitations of this study. Although the sample size is significant, it is relatively small and may not fully reflect the general population. Furthermore, the study is retrospective and did not account for variables such as prior clinical history, modifiable risk factors, and comorbidities, which may influence the results. Future research could include a larger sample size and a more detailed assessment of these aspects.

The clinical implications of these results are significant. The evident effectiveness of cardiac CT in detecting coronary artery disease highlights the need for broader use of this technology in clinical practices. Early diagnosis and timely management of coronary artery diseases can improve long-term outcomes for patients, reducing the incidence of adverse cardiovascular events.

CONCLUSIONS

This article has highlighted the importance of cardiac CT as a diagnostic tool in the evaluation of coronary artery diseases. The results confirm not only the reliability of this method but also its clinical relevance in managing at-risk patients. The data demonstrated a significant incidence of coronary artery diseases among the analyzed patients, with a high percentage of confirmation of significant stenosis through coronary angiography. The Positive



Predictive Value (PPV) of cardiac CT has been confirmed, ranging from 60% to 90%, depending on the prevalence of the disease in the examined population. This underscores the importance of cardiac CT in the diagnostic process, serving as a filter to identify patients who require further evaluations and interventions.

Moreover, the Negative Predictive Value (NPV) of cardiac CT is around 90% or higher, meaning that a negative result is often very reassuring for the absence of significant coronary artery disease. These aspects make cardiac CT a valuable tool not only for identifying diseases but also for reassuring low-risk patients. It is essential that healthcare professionals consider integrating cardiac CT

into their routine practices, especially for at-risk populations. Closer monitoring and the adoption of appropriate screening protocols can help improve the prevention and management of coronary artery diseases.

Finally, it is crucial to promote further studies that explore clinical and demographic variables in more detail, in order to further refine the diagnostic and therapeutic approach. Future research could also examine the long-term impact of cardiac CT usage on the management of cardiovascular diseases. In summary, cardiac CT emerges as a cornerstone in diagnosing coronary artery diseases, and its application could help safeguard the cardiovascular health of the population.

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Institutional Review Board Statement: Informed consent was obtained from all participants involved in the study.

