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# Role of CT Coronary Angiography in Comparison to Invasive Coronary Angiography for Evaluation of Coronary Artery Disease: A Case Series of 30 Patients

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**Abstract:** ***Coronary artery disease (CAD) remains a leading cause of morbidity and mortality worldwide. Early diagnosis and accurate assessment of coronary lesions are crucial for effective treatment planning. Traditionally, invasive coronary angiography (ICA) has been the gold standard for the evaluation of CAD. However, with advancements in imaging technologies, CT coronary angiography (CTCA) has emerged as a promising non - invasive alternative. This case series aims to compare the diagnostic accuracy, patient outcomes, and clinical relevance of CTCA in comparison to ICA for the evaluation of CAD in a cohort of 30 patients.***

**Keywords:** CT coronary angiography, invasive coronary angiography, coronary artery disease, diagnostic accuracy, revascularization, case series.

## 1. Introduction

Coronary artery disease (CAD) is primarily caused by atherosclerotic plaque accumulation in the coronary arteries, leading to arterial narrowing and ischemia. Early diagnosis allows for timely intervention, preventing severe complications like myocardial infarction.

Invasive coronary angiography (ICA) is widely considered the gold standard for CAD diagnosis, but it carries inherent risks such as bleeding, infection, and vessel injury. On the other hand, non - invasive imaging techniques, particularly CT coronary angiography (CTCA), have gained popularity due to their non - invasiveness, high diagnostic accuracy, and ability to provide detailed 3D imaging of coronary vessels.

This study evaluates the role of CTCA compared to ICA by assessing diagnostic accuracy, correlation with clinical outcomes, and procedural risks.

## 2. Methodology

Study Design: This is a retrospective case series involving 30 patients diagnosed with suspected coronary artery disease.

**Inclusion Criteria:**
- Patients aged 40 - 80 years.
- Clinical indications for coronary angiography (e. g., chest pain, abnormal stress test results).
- Both CTCA and ICA performed within 2 weeks of each other.

**Exclusion Criteria:**
- Inability to undergo CTCA (e. g., severe contrast allergy, renal impairment).
- Inability to undergo ICA (e. g., contraindications to angiography).
- Incomplete imaging data.

**Procedures:**
1) CT Coronary Angiography (CTCA): Each patient underwent CTCA using a 128 slice or higher CT scanner. Contrast - enhanced imaging was obtained with retrospective gating. Coronary artery anatomy and the degree of stenosis were analyzed.
2) Invasive Coronary Angiography (ICA): Patients then underwent standard ICA, which served as the reference standard. The degree of stenosis was quantified using the visual assessment or by calculating fractional flow reserve (FFR) where applicable.

**Outcome Measures:**
- Primary Outcome: Comparison of diagnostic accuracy (sensitivity, specificity, positive predictive value, and negative predictive value) between CTCA and ICA.
- Secondary Outcome: Assessment of patient outcomes, such as the need for revascularization (PCI or CABG), complications, and radiation exposure.

## 3. Results

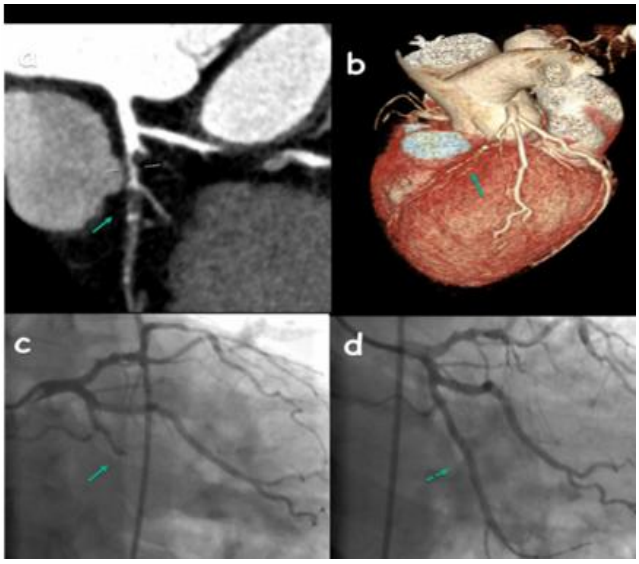
A total of 30 patients (mean age: 61 ± 10 years; 20 males, 10 females) were included in the study. The clinical presentations included stable angina (n=15), unstable angina (n=10), and atypical chest pain (n=5).

**CTCA vs. ICA Results:**
- The sensitivity and specificity of CTCA for detecting significant coronary artery stenosis (>50%) were found to be 92% and 89%, respectively.
- Positive predictive value (PPV) was 90%, and negative predictive value (NPV) was 91%.
- CTCA showed excellent agreement with ICA in detecting coronary lesions, with a kappa coefficient of 0.87.

- In the 30 patients, 18 required subsequent revascularization (PCI or CABG), of which CTCA accurately identified 16 cases (88.9%).

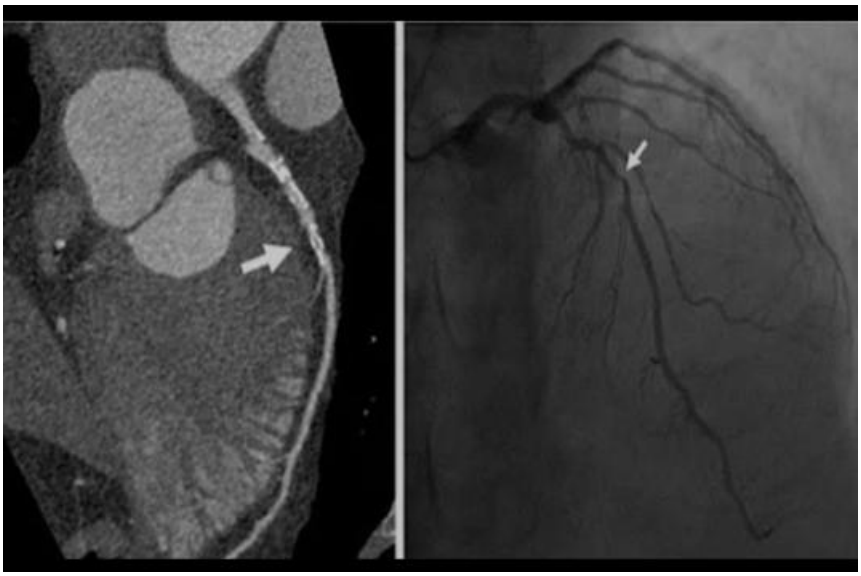
**Patient Outcomes:**

- In 2 cases, CTCA underestimated the severity of coronary artery disease, which was later confirmed by ICA. These patients underwent successful revascularization.
- No major complications related to either CTCA or ICA were reported.
- Radiation exposure during CTCA was significantly lower than ICA (CTCA: 3.5 mSv vs. ICA: 7.8 mSv).
- The contrast dose for CTCA was approximately 70 mL, while ICA required 100 mL.

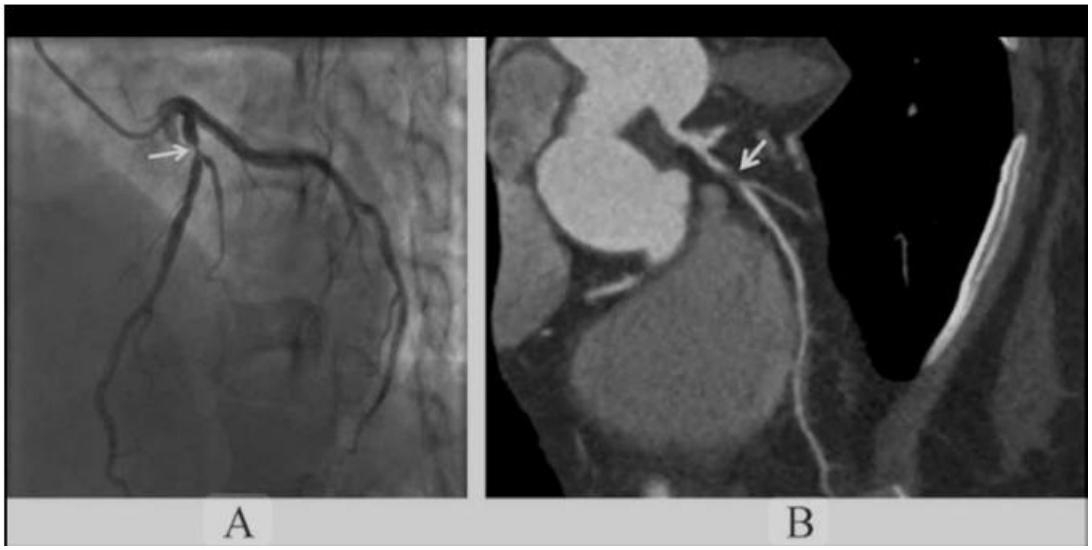



**Case 1:** CCTA image [a, b 3D image] and ICA image [c] of the patient with CAD - RADS 5 lesion (arrow) in the LCX shows occlusion, and after treatment the LCX is observed to be open.

**Case 2:** CCTA and ICA image of the patient with CAD - RADS 3 lesion in proximal LAD. CCTA shows more information on calcified nature of plaque



**Case 3:** CCTA and ICA image of the patient with CAD - RADS 4 lesion in proximal LAD.



## 4. Discussion

This case series supports the growing evidence that CT coronary angiography is a highly accurate, non - invasive imaging modality for the assessment of coronary artery disease. Our findings indicate that CTCA has a high sensitivity and specificity in detecting significant coronary stenosis and is well - correlated with the gold standard, ICA. Moreover, CTCA has the advantage of being less invasive and associated with fewer procedural risks, such as bleeding and vessel injury.

While CTCA is particularly useful in ruling out CAD due to its high negative predictive value, ICA remains indispensable in certain clinical scenarios, especially for patients requiring immediate revascularization or those with high - risk features. The radiation exposure associated with CTCA is lower than that of ICA, making it a safer option for some patient populations, particularly those requiring serial imaging.

**Limitations:**

- Small sample size (30 patients) limits generalizability.
- Retrospective design may introduce selection bias.
- The inability to assess long - term outcomes or follow - up in this case series.

## 5. Conclusion

CT coronary angiography is a reliable and accurate non - invasive alternative to invasive coronary angiography for the evaluation of coronary artery disease. With a high diagnostic accuracy and reduced procedural risks, it can be effectively used in the initial evaluation of CAD, particularly for patients without high - risk features requiring immediate intervention. Further large - scale prospective studies are necessary to fully establish the role of CTCA in clinical practice.

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