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Case Report

# Intra-Atrial Course of Right Coronary Artery: Rare Anatomical Variants Are Becoming More Common with Modern Cardiac CT Scanners

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**Summary**

Coronary artery anomalies, which range from benign variations to potentially malignant conditions, are increasingly being identified due to advancements in coronary computed tomography (CT) imaging. This case report highlights a 51-year-old male patient who was diagnosed with an intra-atrial course of the right coronary artery while undergoing evaluation for symptoms suggestive of angina. The detection of this rare anatomical variant was facilitated by modern cardiac CT technology. Following diagnosis, the patient was thoroughly reassured and educated about his condition. He was advised to avoid excessive physical exertion and was given guidance on lifestyle modifications to manage his symptoms effectively. It is crucial for healthcare providers to be aware of such anomalies, especially when planning surgical interventions or invasive procedures, to prevent potentially catastrophic outcomes.

**Keywords:** Coronary anomalies, intra-atrial course, right coronary artery, invasive procedures, cardiac CT imaging



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## INTRODUCTION

Coronary artery anomalies are congenital malformations of the coronary arteries, with an estimated incidence of approximately 1% in the general population. These anomalies can involve any segment of the coronary arteries, from their origin at the aortic root to their terminal branches [1]. Although the majority of coronary artery anomalies are benign and clinically insignificant, some can manifest with serious symptoms and complications, ranging from chest pain and dizziness to potentially life-threatening conditions such as sudden cardiac death.

The clinical significance of coronary artery anomalies varies widely depending on the specific anatomical variation and its impact on coronary blood flow. In some cases, these anomalies may be incidental findings with no adverse effects, while in others, they can pose significant risks, particularly during physical exertion or invasive procedures.

This case report presents a rare and previously unreported anomaly of the right coronary artery in a male patient. The anomaly was detected through advanced imaging techniques, and detailed characterization was carried out to understand its implications. Written informed consent was obtained from the patient to document and share this unique case, which contributes new insights into the spectrum of coronary artery anomalies and their potential clinical significance.

## CASE REPORT

**Patient Information:** A 51-year-old male with a history of hypertension diagnosed one year prior presented to the outpatient department (OPD) with complaints of palpitations, suffocation, and sweating over the past six months. He denied experiencing chest pain or dyspnea. The patient's past medical history is notable for an appendectomy performed in 2016. There is no significant family history of cardiovascular disease.

**Clinical Findings:** On physical examination, the patient was hemodynamically stable. The systemic examination revealed no abnormalities apart from an appendectomy scar. The patient's vital signs were within normal limits, and no evidence of acute distress was observed.

**Timeline:**

- **Six months prior to presentation:** Onset of symptoms including palpitations, suffocation, and sweating.
- **One year prior to presentation:** Diagnosis of hypertension.
- **2016:** Appendectomy.

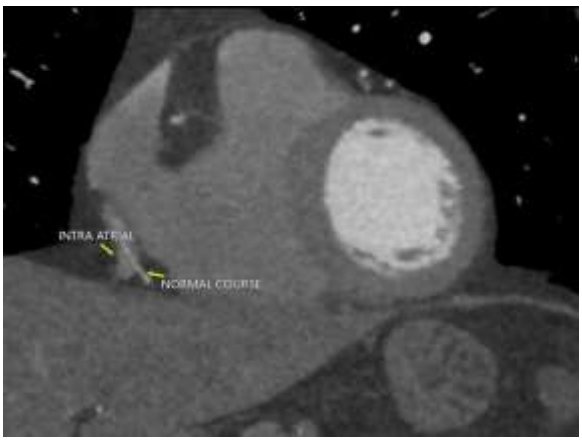


**Figure 1: CT Coronary angiography image showing intra atrial course of right coronary artery.**

**Diagnostic Assessment:**

1. **Electrocardiogram (ECG):** Demonstrated sinus rhythm with no significant ischemic changes.
2. **Echocardiography:** Revealed an ejection fraction (EF) of 60%, with normal cardiac chambers and valvular structures and functions.
3. **Laboratory Tests:** Renal functions, liver functions, serum electrolytes, thyroid profile, complete blood count (CBC), and blood glucose levels were all within normal ranges.
4. **Exercise Tolerance Test (ETT):** Showed ST segment depression of 1.5 mm in inferior and lateral leads, a run of atrial fibrillation at peak stress, and premature ventricular contractions during recovery, which reverted to baseline later.
5. **Duke Treadmill Stress Score:** Calculated as 4.0.
6. **CT Coronary Angiography:** Identified an intra-atrial course of the mid-segment of the right coronary artery approximately 3 cm in length (see Figures 1 and 2). The coronary arteries exhibited a zero calcium score and no significant atherosclerotic plaque.

**Therapeutic Intervention:** The patient's presentation and diagnostic findings suggest a rare anatomical variation of the right coronary artery which might contribute to his symptoms. Given the normal coronary arteries and the absence of significant atherosclerotic disease, initial management focused on symptomatic relief and close monitoring. The patient was advised to modify his physical activity levels and was started on appropriate medications to manage his symptoms.

**Follow-up and Outcomes:** The patient was scheduled for regular follow-up visits to monitor his symptoms and response to treatment. During follow-up, the patient reported a gradual improvement in symptoms. Continued assessment included periodic echocardiography and stress testing to ensure stability and to evaluate any potential changes in his cardiac condition. The patient was educated about the importance of lifestyle modifications and adherence to prescribed medications.


**Figure 2: CT coronary image showing intra atrial course of right coronary artery.**
*3D image on the left side and 2D image on the right side.*

## DISCUSSION

The right coronary artery (RCA) typically originates from the right coronary cusp and progresses as an epicardial vessel antero-inferiorly in the right atrioventricular groove. It then bifurcates into the posterior left ventricular (PLV) and posterior descending artery (PDA) branches at the crux of the heart. However, the intra-atrial course of the RCA is an exceedingly rare anatomical variation, with an incidence reported around 0.36% [2]. Historically, such anomalies were often identified postmortem, as demonstrated by Kolodziej AW and colleagues [3], who described three cases with varying entry and exit points and lengths of the intracavitary course.

Advancements in coronary computed tomography (CT) imaging have significantly improved the detection of this and other coronary anomalies. Unlike conventional angiography, which may miss such anomalies, CT coronary angiography offers superior visualization and detection capabilities [4]. In our case, the RCA exhibited a mid-segment intra-atrial course approximately 3 cm in length, without evidence of obstructive coronary disease. Previous case reports have documented intracavitary courses ranging from 1.5 cm to 5 cm [5,6]. This anomaly comprises three segments: the aerial, mural, and intracavitary parts [7].

While the aerial segment typically lacks clinical significance, the mural and intracavitary segments are clinically important, especially in the context of invasive procedures. Inadvertent damage to these segments during electrophysiological studies, pacemaker implantation, right heart catheterization, coronary artery bypass grafting, or other open-heart surgeries can lead to severe complications. Potential risks include the development of a left-to-right shunt or an air lock in the cardiopulmonary system, which could result in fatal outcomes [8,9].

Therefore, accurate identification of such anomalies before surgical or invasive interventions is crucial to

prevent catastrophic complications. Enhanced imaging techniques like CT coronary angiography play a pivotal role in detecting these rare variations, ensuring better planning and risk management for patients undergoing complex cardiac procedures.

## CONCLUSION

Intra-atrial anomalies of the right coronary artery are rare and often benign; however, their detection is crucial prior to open-heart surgery or invasive procedures. Identifying such anomalies before undertaking these procedures is essential to prevent potentially catastrophic complications, ensuring patient safety and optimal outcomes.

## AUTHORS' CONTRIBUTION

IG, MWA, NNU, MMK and MG: Concept and design, data acquisition, interpretation, drafting, final approval, and agree to be accountable for all aspects of the work. IG, MWA, NNU, MMK and MG: Data acquisition, interpretation, drafting, final approval and agree to be accountable for all aspects of the work.

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