

Review

Contemporary Understanding and Importance of Coronary Artery Ectasia: A Narrative Review

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Abstract

Coronary artery ectasia (CAE) is a rare but clinically important vascular abnormality defined by localized or diffuse dilation of a coronary artery segment to at least 1.5 times the diameter of adjacent normal vessels. The prevalence and clinical impact of CAE vary widely by geography and ethnicity, with higher rates seen in Mediterranean, Middle Eastern, and Asian populations. While over half of cases are associated with atherosclerosis, congenital anomalies, connective tissue disorders, vasculitis, and trauma represent important non-atherosclerotic etiologies. Recent insights into chronic inflammation, extracellular matrix degradation, genetic predisposition, and epigenetic alterations have expanded the understanding of CAE pathogenesis. Although many patients remain asymptomatic, CAE can present with angina, myocardial infarction, or even sudden cardiac death. Diagnostic advances, such as coronary computed tomography angiography and intravascular ultrasound, enable more precise evaluation, but standardized criteria and management guidelines remain lacking. Current management focuses on risk factor modification and antithrombotic therapy, though the optimal regimen is uncertain, and the efficacy of invasive interventions is not well established. Long-term prognosis is highly variable, underscoring the need for region-specific studies, robust clinical trials, and the development of personalized care strategies. Future research priorities include genetic and molecular studies, creation of evidence-based protocols, and the exploration of novel therapeutics to improve outcomes for patients with CAE.

Keywords: Coronary Aneurysm, Atherosclerosis, Platelet Aggregation Inhibitors, Coronary Angiography, Vasculitis

INTRODUCTION

Coronary artery ectasia (CAE) is a rare yet clinically significant condition characterised by the dilation of coronary arteries by at least 1.5 times the diameter of adjacent normal segments. It may manifest in localised regions or diffusely across multiple coronary arteries (1). The prevalence of CAE varies greatly between geographic regions and ethnic groups, with higher rates seen in Mediterranean, Middle Eastern, and Asian populations. It is often found by accident during coronary angiography (2,3).

PATHOPHYSIOLOGY AND CHALLENGES

CAE predominantly affects males over 50 years old and is most commonly associated with atherosclerosis, accounting for over half of cases (4). However, a big part of the cases are caused by things other than atherosclerosis. These include birth defects, connective tissue disorders (like Marfan syndrome and Ehlers-Danlos syndrome),

vasculitis (like Kawasaki disease), and injuries (5). The right coronary artery (RCA) is most frequently affected, followed by the left anterior descending (LAD) and circumflex arteries (6).

Researchers have found that chronic inflammation, breakdown of the extracellular matrix, and loss of smooth muscle are some of the main factors that cause this (4). Recently, new studies have linked genetic predisposition and epigenetic changes to the development of CAE, suggesting possible areas for further research.

CLINICAL FEATURES AND EMERGING DIAGNOSTIC MODALITIES

While many CAE patients are asymptomatic, others present with chest discomfort or angina due to altered coronary blood flow, thrombosis, or embolism (7). Complications include myocardial infarction, aneurysmal changes, and, in severe cases, sudden cardiac death (8). Despite its clinical significance, CAE remains underdiagnosed, partly

due to a lack of standardised diagnostic criteria.

Recent advancements in imaging technologies, such as coronary computed tomography angiography (CCTA) and intravascular ultrasound (IVUS), provide more detailed assessments of coronary artery morphology and plaque characterisation (9). Also, creating new biomarkers to find inflammatory or thrombotic activity in CAE could help with early detection and figuring out who is at risk.

RESEARCH GAPS AND MANAGEMENT CHALLENGES

Management of CAE remains challenging due to the lack of consensus guidelines. Current approaches focus on mitigating cardiovascular risk factors and preventing complications, particularly thrombus formation. Patients with significant thrombotic burden commonly employ antiplatelet therapy, such as aspirin, with the addition of anticoagulation (10). However, the optimal combination, dosage, and duration of antithrombotic therapy remain areas of active debate.

In severe cases, surgical interventions like coronary stenting or bypass grafting are considered, but it's unclear how effective they are in CAE-specific contexts (11). There is a pressing need for clinical trials to evaluate the effectiveness of tailored therapies for CAE patients, particularly those with coexisting CAD.

PROGNOSIS AND FUTURE DIRECTIONS

The long-term prognosis of CAE is highly variable, with outcomes ranging from asymptomatic stability to significant ischaemic heart disease and myocardial infarction (12). Emerging evidence suggests that integrating advanced imaging with predictive models could improve risk stratification and guide personal management strategies.

Future research should prioritise:

1. Genetic and Molecular Insights: Identifying genetic markers or molecular pathways associated with CAE to better understand its aetiology.
2. Standardised guidelines: developing evidence-based protocols for diagnosis and management to address the current variability in clinical practice.
3. Region-Specific Studies: Exploring geographic and ethnic disparities in prevalence to inform regionally tailored approaches.
4. Therapeutic Innovations: Investigating novel antithrombotic therapies, endovascular techniques, and regenerative strategies to address arterial wall damage.

CONCLUSION

CAE is an uncommon but clinically relevant condition within the spectrum of CAD, with significant implications for patient outcomes. Addressing the current gaps in understanding and management through innovative research and personalised care will be critical to improving the prognosis for CAE patients. As we advance, integrating emerging technologies and evidence-based strategies promises to enhance diagnosis, risk stratification, and treatment outcomes.

Key messages:

- **Definition and Epidemiology:** Coronary Artery Ectasia (CAE) is a rare dilation of coronary arteries (≥ 1.5 times the normal size), found in 0.3%-5% of patients undergoing coronary angiography. Primarily detected in males over 50, with heightened prevalence among Mediterranean, Middle Eastern, and Asian populations.
- **Aetiology:** Atherosclerosis: The primary aetiology in over 50% of cases. Non-atherosclerotic aetiologies include congenital defects, connective tissue disorders (e.g., Marfan syndrome), vasculitis (e.g., Kawasaki disease), and trauma.
- **Pathophysiology:** Driven by chronic inflammation, degradation of the extracellular matrix, and loss of smooth muscle within the arterial wall. Complications include an increased risk of thrombosis, embolism, myocardial infarction, aneurysmal rupture, and sudden cardiac death.
- **Evaluation:** The definitive method is coronary angiography. Advanced modalities: CT Coronary Angiography (CCTA), Intravascular Ultrasound (IVUS), and Optical Coherence Tomography (OCT). **Management:** Focus on mitigating cardiovascular risk factors. Antiplatelet therapy, such as aspirin, and anticoagulation are used for the management of thrombotic risk. There are critical surgical interventions (such as stenting or bypass).
- **Research Deficiencies:** The necessity for uniform diagnostic and therapeutic protocols. There has been a lack of comprehensive studies and a restricted comprehension of genetic predispositions. **Future directions:** genetic and molecular research, advanced imaging techniques, and localised studies for personalised treatments.

DECLARATIONS

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