

# Analysis of Coronary Artery Ectasia: Experience from a Tertiary Care Hospital in South India

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## Abstract

**Background:** Coronary artery ectasias (CAE) could have a prediction for coronary artery disease (CAD). Ectatic coronary arteries even without the presence of coronary stenoses are subject to thrombus formation, vasospasm, and spontaneous dissection. The presence of ectatic segments produces sluggish blood flow, with exercise-induced angina and myocardial infarction, regardless of the severity of coexisting stenotic coronary disease.

**Objectives:** The present study was done to analyze the incidence of CAE and to check the association of CAE with CAD.

**Methods:** This was a retrospective study of 7148 patients who had coronary angiogram from 2010 to 2015. Details of the patients and clinical symptoms were analyzed. Electrocardiography was evaluated for various abnormalities. The treadmill test was performed utilizing modified Bruce protocol. The angiogram films were reviewed with two blinded observers.

**Results:** 257 patients had angiographic evidence of CAE. The most commonly affected vessel was the right coronary artery (88.73%) followed by a left anterior descending artery (41.63%), left circumflex artery (28.79%), and left main coronary artery (5.45%). The most common type of ectasia seen was Type IV ectasia (80%) followed by Type III (9%) and Type II (8%). Lowest percentage distribution (3%) was seen among Type I group. The greater incidence of ectasia was seen in the proximal segment of the coronary arteries compared to the distal segment.

**Conclusion:** Coronary ectasia can cause flow limiting obstructive lesions and could have guarded prognosis in view of its propensity of layered thrombus formation.

**Key words:** Coronary angiogram, Coronary artery disease, Coronary ectasia, Right coronary artery

## INTRODUCTION

Coronary artery ectasia (CAE) has been recognized as an uncommon pathological finding for many years. The first autopsy-proven demonstration of CAE was done by Morgagni<sup>1</sup> in 1761 and Gougon in 1812. It affects 0.46-4% of general population, but the etiology of the disorder remains uncertain. CAE or aneurysmal coronary artery disease (CAD) is defined as dilatation of an arterial segment to a diameter of at least 1.5 times that of the adjacent

normal coronary artery. CAE can be found in up to 5% of angiographic and in 0.22% to 1.4% of autopsy series. It can be either diffuse affecting the entire length of a coronary artery or localized. When the dilatation involves the entire vessel, the word “ectasia” is used instead of an aneurysm. CAE or the aneurysm is attributed to atherosclerosis in 50% of cases, whereas 20-30% have been considered to be congenital in origin. In the great majority of these patients, ectasia coexists with CAD. Only 10-20% of cases of CAE have been described in association with inflammatory or connective tissue diseases. In the western population, the most common association had been with coronary atherosclerosis. Other conditions in which CAE or an aneurysm has been noted include Ehlers Danlos syndrome, polyarteritis nodosa, scleroderma, cystic medionecrosis, trauma, mycotic embolus, syphilitic aortitis, antineutrophil cytoplasmic antibody-related vasculitis, Kawasaki disease, and iatrogenic (angioplasty and atherectomy).<sup>2-6</sup>

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Most published series suggest that the incidence in patients investigated for ischemic heart disease is between 1% and 2.5%. The clinical significance of CAE is not clear. It has been suggested that coronary ectasia alone is as important as the presence of coronary stenosis. Various other studies have shared no difference from a control population with ischemic heart disease. An association with the aortic aneurysm has also been reported, although many series do not mention any relation between the two. It has been stated that the presence of ectasia does not affect the outcome of coronary artery bypass graft unless the graft is sutured to the wall of the ectatic segment. In a study in British Heart Journal, Hartnell<sup>7</sup> reviewed 4993 patients, out of which 70 patients had CAE. It has been suggested that CAE alone may be a cause of angina. In his study, he observed that in patients with angina, ectasia accompanies at least some degree of coronary artery narrowing. Slow or turbulent blood flow in a dilated vessel might be expected to lead to thromboses and a high mortality rate. In the European coronary surgery study, the mortality of those with CAE who were treated medically is similar to the 5 years mortality (13% as compared to 10%).

The incidence of CAE is predominantly in men. The right coronary artery (RCA) is more commonly affected followed by left anterior descending (LAD) artery, left circumflex (LCX) artery, and left main coronary artery (LMCA). The presence of ectatic segments produces sluggish blood flow, with exercise-induced angina and myocardial infarction, regardless of the severity of coexisting stenotic coronary disease.<sup>8,9</sup> The introduction of new non-invasive modalities,<sup>10</sup> such as coronary artery computed tomography and magnetic resonance angiography, and the systematic testing of modern antiplatelet and vasoactive medication, look promising for the better treatment and prognosis of these patients.

Clinical literature suggests that ectatic coronary arteries even without the presence of coronary stenosis are subject to thrombus formation, vasospasm, and spontaneous dissection. Newer subgroups of ectasia are increasing with the use of multiple intervention devices to dilate coronary artery stenosis. By design, these destroy the media of the coronary arteries and it is not clear whether these iatrogenic ectatic coronary arteries are subject to the same complication as idiopathic CAE.

The present study was done to analyze the incidence of CAE and to check the association of CAE with CAD. It was also aimed at observing the distribution of CAE with regard to vessel involvement and pattern and to compare the angiographic profile of patients with CAE and CAD.

## MATERIALS AND METHODS

This was a retrospective study of 7148 patients who had coronary angiogram from 2010 to 2015 in Sri Ramachandra Hospital, of which 257 patients had angiographic evidence of CAE. The study comprised integrated information in two areas of interest. Details of the patients, mode of presentation- whether atypical chest pain, angina on effort, acute coronary syndrome or acute myocardial infarction alone, with risk factor stratification, such as presence or absence of smoking, hypertension, diabetes mellitus, were noted. A basic investigation like electrocardiography (ECG) was evaluated as to whether it was normal or abnormal as characterized by >1.5 mm depression in ST segment in >2 contiguous leads, >1 mm ST elevation in >2 contiguous leads, abnormal Q waves, R wave progression, conduction defects. 65 patients could not perform stress test either due to the acute presentation of chest pain or a baseline abnormal ECG. The Treadmill test was performed utilizing Bruce protocol in the remaining patients.

The angiogram films were reviewed on a SIEMENS AXIOM ARTIF dFC system with two blinded observers. CAE was defined as at least one localized dilatation of a coronary artery segment to >1.5 times the diameter of the adjacent normal vessel. The incidence of CAE during the study period was noted, and the distribution of ectasia in various coronary arteries and the type of CAE based on Markis classification was also studied. The presence or absence of stenoses and, its severity was noted.

Statistical analysis for comparison of the various data was carried out by the distributive statistics.

## RESULTS

257 patients had coronary ectasia, 224 males and 33 females. 105 patients had a history of smoking; 162 had hypertension, and 179 patients had diabetes mellitus. 209 patients had pure ectasia while 48 had an association with CAD.

Graph 1 represents the split up of Type I, Type II, Type III, and Type IV. Type I represents diffuse ectasia of 2 or 3 vessels, Type II represents diffuse ectasia in one vessel and localized disease in another vessel, Type III represents diffuse ectasia of one vessel only, and Type IV represents localized or segmental ectasia. A higher percentage (80%) was seen in Type IV group followed by Type III (9%) and Type II (8%). Lowest percentage distribution (3%) was seen among Type I group.

Graph 2 depicts the distribution of ectasia in coronary arteries. The majority (88.72%) were seen among RCA followed by 41.63% in LAD, 28.79% in LCX, and 5.45% in LMCA. The lowest percentage (1.17%) was seen in Ramus intermedius (RI).

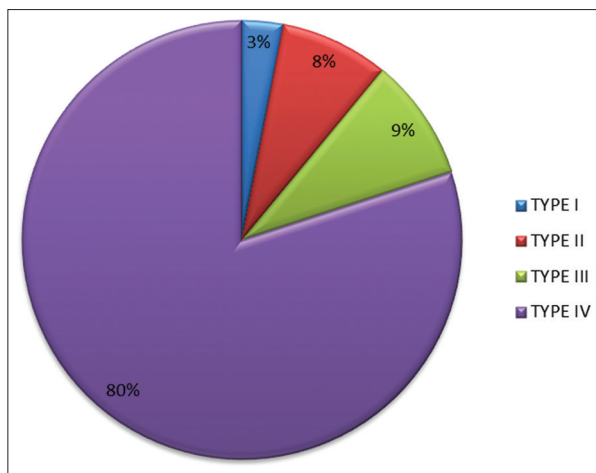
Distribution of ectasia and ectasia with CAD are shown in Graphs 3 and 4. Ectasia in proximal LAD is found to be high (33.85%) when compared to ectatic CAD (6.61%), followed by 7.78% of ectasia in LMCA, 5.45% in mid LAD, 4.28% in distal LAD, and the least ectasia (1.17%) was seen in RI. Ectatic CAD in proximal RCA was also found to be high (76.26%), 24.9% had ectasia in mid RCA, 19.46% in proximal LCX, 12.84% in distal RCA, 9.73% in mid LCX, and the least ectasia (4.67%) was seen in distal LCX.

## DISCUSSION

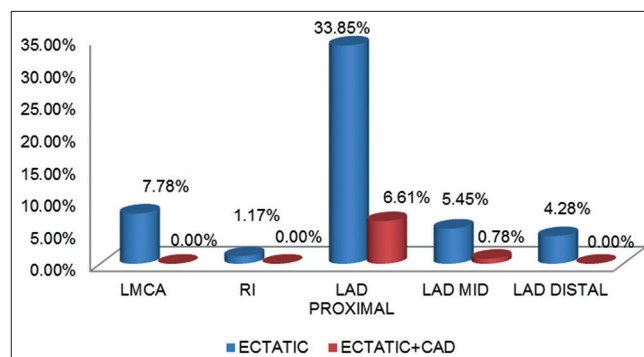
In world literature, the incidence of CAE varies from 0.2% to 4.9%.<sup>11,12</sup> In our study, the incidence of CAE is 4% (95% CI 3.2-4.1). The gender difference in incidence has been reported before and has been partially attributed to the lower incidence of CAD in women. In our study, the majority of the patients were males with a mean age

of  $57.20 \pm 10.66$  and female had a mean age of  $60.09 \pm 10.84$ . This data is in agreement with current literature. There were no cases of the abdominal aneurysm, Marfan's syndrome or connective tissue disorder in our series, and the most common associated disorder was atherosclerotic CAD. The resting ECG was abnormal in the majority of cases, which confirms the findings of Markis *et al.*<sup>13</sup> There was evidence of exercise-induced ischemia in ectasia only group. This suggests that despite the absence of flow-limiting obstruction, ischemia is still manifested as demonstrated by abnormal ECG, typical symptoms or evidence of exercise-induced ischemia. It is likely that endothelial dysfunction abnormalities are involved in the genesis of ischemia in CAE. This is in agreement with current world literature on the significance of CAE. Initially, it was thought of as benign disorder related to connective tissue disorders. However, over the years with the increase in the number of catheterization procedures, availability of procedures to analyze coronary blood flow and quantity perfusion, it is felt that CAE is not benign, is a variant of atherosclerotic CAD and can induce ischemia and infarction in the absence of the significant flow-limiting stenotic CAD.

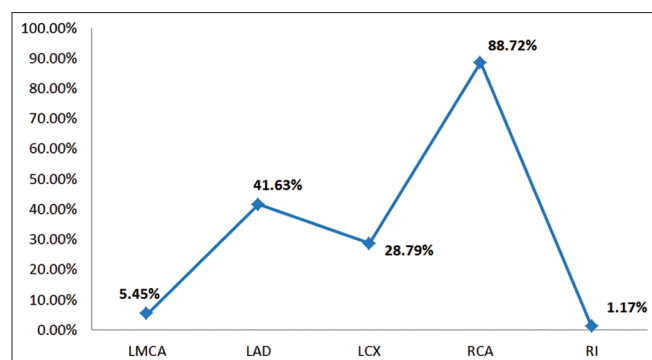
Our angiographic findings were similar to previous reports where the RCA is most commonly affected vessel while the left main, and RI are the least commonly affected. In this series, the most commonly affected vessel



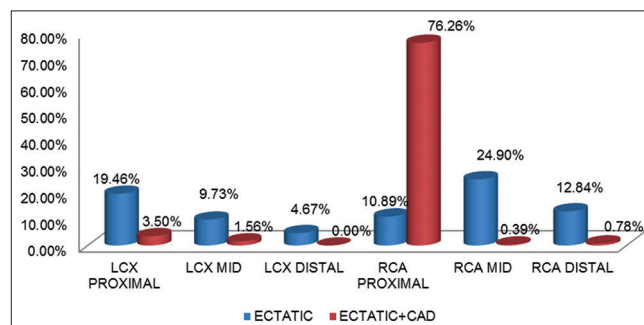
Graph 1: Type of ectasia



Graph 3: Distribution of ectasia in Left coronary artery



Graph 2: Coronary distribution of ectasia



Graph 4: Distribution of ectasia in RCA and LCX

was the RCA (88.73%) followed by LAD artery (41.63%), LCX artery (28.79%), and LMCA (5.45%), RI (1.17%) which is in agreement with data from world literature except a significant increase in the percentage of LAD artery. The most common type of ectasia seen in this series was 80% in Type IV group followed by Type III (9%) and Type II (8%). Lowest percentage distribution (3%) was seen among Type I group. In a study by Valente *et al.*,<sup>14</sup> Type III was more common followed by Type IV and Type I with RCA most commonly affected. Lam and Ho<sup>15</sup> showed that RCA ectasia was more common followed by LAD and the least common involvement with the left main branch.

The greater incidence of ectasia was seen in the proximal segment of the coronary arteries compared to the distal segment. Harikrishnan *et al.*,<sup>16</sup> in his study, also noted a greater incidence of proximal lesions. Diffuse coronary atherosclerosis seems to be most common etiology in this series. An interesting observation was made in this study with regard to co-existent CAD. Only patients who had RCA ectasia had a higher percentage of CAD. In studies by Valente *et al.* and Lam and Ho, the incidence of co-existent CAD was 58.1% and 82%, respectively.

## CONCLUSION

The study revealed a 4% incidence of CAE. The management of coronary ectasia is controversial because of bad long term results. Flow limiting obstructive lesions with ectatic arteries also show guarded prognosis in view of its propensity of layered thrombus formation.

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