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Research Article

CORONARY ANGIOGRAPHIC AND CLINICAL CHARACTERISTICS OF PATIENTS WITH CORONARY ARTERY ECTASIA; AN EXPERIENCE FROM SRI LANKA

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ABSTRACT

Coronary Artery Ectasia (CAE) is a well-recognized but relatively uncommon finding encountered during diagnostic coronary angiography in patients who are investigated for ischemic heart disease. There is scarcity of data regarding the behavior of this phenomenon among our local community.

Objective: The study was aimed to explore the clinical and angiographic characteristics of patients with CAE in a cohort of Sri Lankan patients.

Methods: A retrospective cross-sectional study was conducted at cardiology unit Kandy, Sri Lanka on patients who underwent coronary angiograms from 2014 to 2016. Demographic and clinical data were obtained from medical records. Angiograms were reviewed by two examiners individually.

Results: There were 107 patients with CAE with a mean age of 53.51±9.62 years. There were 81.31% (n=87) of males. The prevalence of diabetes, hypertension and dyslipidemia in the study sample was 27.10% (n=29), 28.04% (n=30) and 20.56% (n=22) respectively. Right Coronary Artery (RCA) was the most frequent (60.75%, n=65) culprit territory. Ectasia of the Left Anterior Descending (LAD) artery and Left Circumflex (LCX) were seen in 47.66% (n=51) and 42.99% (n=46) respectively. Severe generalized coronary ectasia [Markis classification type I] was seen in 26.17% (n=28) and type II and III were found in 35.51% (n=38) and 17.76% (n=19) respectively. Localized ectasia was seen in 20.56% (n=22) of cases. There were 38.31% (n=41) having significant atherosclerotic stenosis in the same ectatic arteries and 21.50% (n=23) had stenosis in the non-ectatic arteries (x^2=42.43, p<0.00). These were a higher incidence of Non ST Elevated Myocardial Infarctions (NSTEMI) observed among these patients compared to other acute coronary events.

Conclusion: CAE is frequently found in RCA territory and most of the atherosclerotic plaque lesions also were observed in the same ectatic territory. Interestingly, these patients were found to have high preponderance to have recurrent NSTEMIs among all other acute coronary events. Therefore, the micro-vascular mechanisms, endothelial response and intra-vascular flow dynamics of these ectatic patients should be further evaluated to understand the pathophysiology and the behavior of the disease.

INTRODUCTION

Coronary Artery Ectasia (CAE) is fairly an uncommon but interesting angiographic finding encountered during cardiac catheterization. It is commonly defined as inappropriate dilation of the coronary artery exceeding the largest diameter of an adjacent normal vessel more than 1.5 fold [1].

As for the etiology, 20% to 30% of cases of coronary ectasia are considered congenital in origin and the others are acquired. Of the acquired cases, 50% are related to atherosclerosis while 10% to 20% are associated with inflammatory and connective tissue diseases [2].

Importantly, the most common clinical presentation related to this phenomenon is ischemic coronary events. These may include ST-elevation myocardial infarction, Non-ST-Elevation Myocardial Infarction (NSTEMI), cardiac arrhythmias, spontaneous dissection of an ectatic coronary artery, and even sudden cardiac death [3]. In addition, studies have shown that there is altered coronary flow dynamics in these patients results in slow flow phenomenon as well [4].

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Although this angiographic finding of an abnormal coronary artery has been recognized long ago, its clinical profile, associations and angiographic pattern have not been clearly documented among our local population. Therefore, the study was aimed to explore the clinical and angiographic characteristics of patients with CAE in a cohort of Sri Lankan patients.

METHODOLOGY

Study design and setting

A retrospective cross-sectional study was conducted at cardiology unit teaching hospital Kandy, Sri Lanka analyzing coronary angiographic data from 2014 to 2016. A consecutive sample of patients who had ectatic coronary arteries during above period was considered for the study.

Data collection process

All patients and clinical records were reviewed and the baseline characteristics were recorded including age, gender, history of diabetes mellitus, hypertension, dyslipidemia, smoking status and family history of coronary artery disease. Past medical records were explored and echocardiographic findings, serum creatinine level, and information regarding current medications was obtained.

Angiographic analysis

All the angiograms were reviewed by two experienced cardiologists and the ectatic segments were identified. Coronary ectasia was defined as dilatation of a coronary artery to 1.5 times or more than a normal adjacent coronary vessel segment according to Falsetti and Carroll [5] criteria (*Figure 01*). The specific type of ectasia was classified according to Markis classification [6]. According to that diffuse ectasia in two or three vessels was classified as type I; diffuse disease involving one vessel and localized disease in another vessel classified as type II; diffuse ectasia found in only in a single vessel as type III; and focal ectasia as type IV.

Significant coronary artery stenosis was defined as stenosis of at least 70% in a major epicardial vessel.

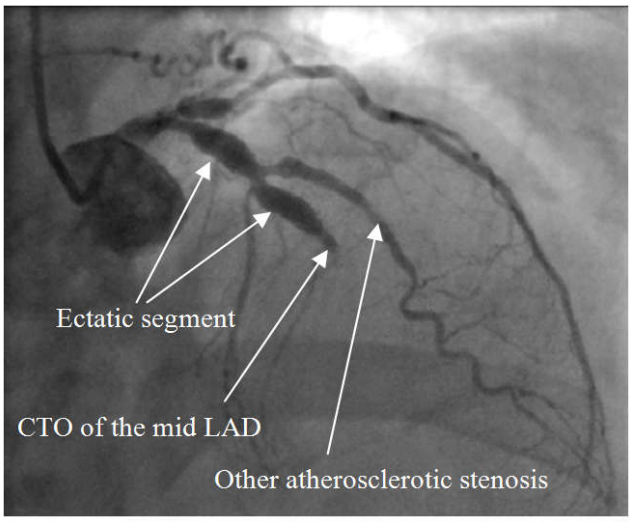

Figure 1 A coronary angiogram demonstrating the ectatic coronary segments with plaque disease in a left anterior descending artery (CTO= Chronic Total Occlusion, LAD= Left Anterior Descending Artery)

Statistical analysis

SPSS version 17.0 was used for data entry and analysis. The statistical significance of continuous variables among subgroups were evaluated by Student t-test and variation of categorical variables were evaluated by Chi- square test. A p value of < 0.05 or 95 % confidence limit was considered as significant.

Ethical clearance

Ethical clearance was obtained from the ethical review committee of teaching hospital Kandy, Sri Lanka. Informed written consent was obtained from all the patients.

RESULTS

There were 107 patients with CAE with a male preponderance (81.31%, n=87). The mean age of the study sample was 53.51±9.62 years. The baseline characteristics and the comorbid profiles of patients are shown in *Table 1*.

Table 1 Baseline characteristics of the study group

Variable	Results
Age (mean ± SD)	53.51±9.62 years
Gender	
Male	81.31% (n=87)
Female	18.69% (n=20)
Co-morbidities	
Diabetes	27.10% (n=29)
Hypertension	28.04% (n=30)
Dyslipidemia	20.56% (n=22)
Smoking*	34.58% (n=37)
Family history of CAD	20.56% (n=22)
Incidence of coronary events	
Stable angina	11.21% (n=12)
Unstable angina	09.25% (n=09)
STEMI	19.63% (n=21)
NSTEMI	57.94% (n=66)
Serum creatinine	0.95±0.26 mg/dL
LV EF	52.29±11.26 %

SD= Standard Deviation , NSTEMI= Non ST Elevated Myocardial Infarction, STEMI=ST Elevated Myocardial Infarction , LVEF=Left Ventricular Ejection Fraction, Smoking*= Current and ex-smokers, CAD= Coronary Artery Diseases

Ectasia affecting coronary artery territories

CAE was seen more frequently in the Right Coronary Artery (RCA), which was 60.75% (n=65). Ectasia of the Left Anterior Descending (LAD) artery and Left Circumflex (LCX) artery were seen in 47.66% (n=51) and 42.99% (n=46) respectively (*Figure 02*). Among the ectatic RCA, proximal RCA was the commonest segment involved (64.62%, n=42).

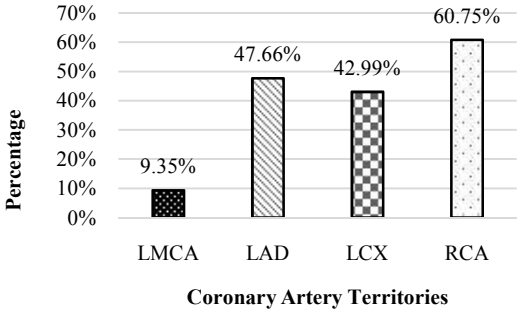

Figure 2 Distribution of ectasia among coronary arteries

Distribution of the type of coronary Ectasia in the study sample

Severe generalized coronary ectasia [Markis classification type I] was seen in 26.17% (n=28), and type II and III were found in 35.51% (n=38) and 17.76% (n=19) respectively. Localized ectasia was seen in 20.56% (n=22) of cases, of which 59.09% (n=13) were saccular and 40.91% (n=9) were fusiform in character (*Figure 3*).

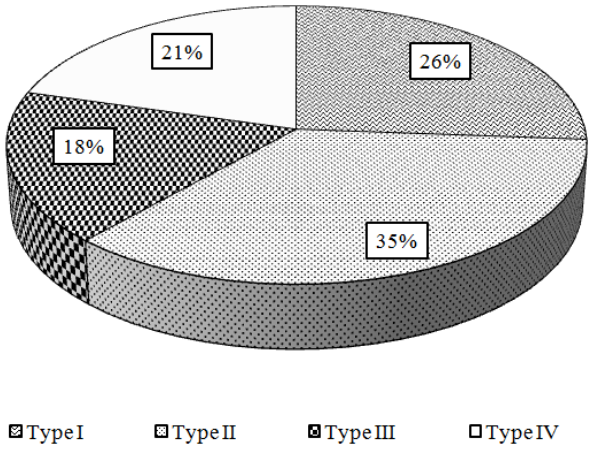

Figure 3 Distribution of different type of coronary ectasia according to Markis Classification

The association of Ectasia and plaque disease

There were 72.90% (n=78) with concomitant significant obstructive plaque disease and 27.10% (n=29) with dilated coronaropathy (i.e. ectasia without coronary obstruction). There were 38.31% (n=41) having significant atherosclerotic stenosis in the same ectatic artery and 21.50% (n=23) had stenosis in the non-ectatic artery (x^2=42.43, p<0.00).

Patients with dilated coranaropathy

There were 27.10% (n=29) of patients with dilated coranaropathy (*Figure 04*). Among them 13.79% (n=4) had in-situ thrombi, 27.59% (n=8) had coronary slow flow and 44.83% (n=13) had recurrent NSTEMI. There was no statistical significance of age (p=0.23), gender (p=0.16), prevalence of hypertension (p=0.34), diabetes (p=0.52) or dyslipidaemia (p=0.87) among patients with dilated coronaropathy compared to ectatic patients with plaque disease *(Table 02).*

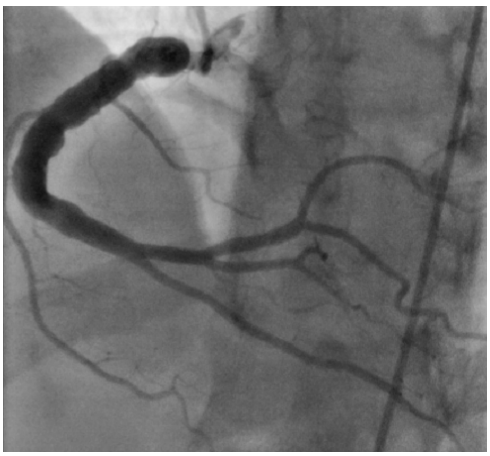

Figure 4 Right coronary artery with severe generalized ectasia with no obstructive plaque disease

Table 2 Comparison of patients with dilated coranaropathy versus ectatic patients with plaque disease

Variable	Dilated Coronaropathy	Ectasia & Stenosis	P value
Age (mean ± SD)	52.17±9.97	51.93±7.77	0.23
Gender (Male%)	75.69%	72.41%	0.16
Prevalence of Hypertension	21.79%	20.68%	0.34
Diabetics	20.51%	17.24%	0.52
Dyslipidemia	20.51%	20.68%	0.87

SD= Standard Deviation

DISCUSSION

The initial case report of an aneurism of a coronary artery was described by *Bourgon* in 1812 as a postmortem finding of a right coronary artery dilatation in a patient who had sudden cardiac death [5]. Thereafter, *Markis et al*. provided the first comprehensive evaluation of the incidence of CAE and propose a classification system to describe these phenomena [6]. Nowadays, it has been recognized as a relatively un-common finding in angiographic evaluation of patients with ischemic heart disease with an average incidence of 1-5% [2] and it is evident to be strongly associated with atherosclerosis and subsequent myocardial ischemia.

CAE is expected to represent an extravagant form of vascular remodeling process that happens as a response to atherosclerotic vascular insult in a coronary artery. Though the exact mechanism is unclear, the biological degradation of extracellular matrix of the tunica media is proposed to be the key pathophysiologic mechanism, which is believed to be governed in this condition [7].

Many authors believe that CAE is not entirely a benign angiographic finding. Therefore, those patients with ectatic coronaries should be considered having potential risk of getting acute coronary syndromes even though they do not have identifiable atherosclerotic plaque disease in their coronary arteries. There are many evidence supporting this idea that these abnormally dilated vessel segments may produce altered flow dynamics that results in in-situ thrombi formation, induction of significant arterial spasm or creating spontaneous dissections in the blood vessels [8]. Thus, these patients can have variable spectrum of acute coronary syndrome including unstable angina to myocardial infarction.

Though CAE can be associated with other vascular inflammatory conditions such as syphilitic aortitis, connective tissue disorders and Kawasaki's disease [9], our study sample didn't had any of the patients belonged to these conditions but many were having atherosclerotic coronary artery disease.

Though CAE can affect any part of the coronary tree, several studies have revealed that RCA is having the commonest involvement [2,10,11,12,13]. Similarly, our study also found that RCA is the mainly involved vessel in 60.75% of cases. However, contrast to this, some studies had shown that the LAD is the main vessel involving CAE [13] but in our study, only less than half of them had LAD involvement. Though RCA is the common culprit for this event, the explanations for this higher predilection to ectasia in RCA territory is not exactly understood.

In the present study 27.10% patients with CAE suffered from diabetes. Similarly, a study conducted by *Sultana et al* [14] on Pakistanis' found that their prevalence of diabetes in ectatic patients was 26%. However, another research conducted by *Mohammed A A et al* [3] revealed that the prevalence of diabetes mellitus in their sample was much higher at 59%. However, these finding are contrast to some of the previous meta-analysis that showed the prevalence of diabetes mellitus in patients with coronary artery ectasia was 8-33% [15] and suggested that diabetes might inversely associated with CAE [16]. However, this higher incidence of diabetes among these study groups may be as a result of high prevalence of diabetes mellitus among people of Middle East [17] rather than a specific association. Therefore, these contradictory results indicate the requirement of further studies to evaluate the relationship between diabetes and CAE in more detail among Asians.

Our study indicates that they have variable clinical presentations including stable angina, unstable angina, NSTEMI or STEMI. However, among all these presentations, the recurrent NSTEMI is the commonest manifestation. According to our observation, one of the explanations for this may be the tendency to develop small thrombi that results in infarctions as a result of stagnation of blood flow in these vessels [9]. Therefore, special interest to be made to prevent recurrent acute coronary events in this specific entity of patients by appropriate therapeutic measures.

Our study findings indicate that there is a strong association of the occurrence of atherosclerotic plaque disease in the ectatic arteries than in the non-ectatic arteries. This may reflect the association of related common pathophysiology to both atherosclerosis and CAE. The comparison made in our study between the patients with dilated coranaropathy versus patients with ectatic vessels with athermatous plaque disease showed that there is no significant difference of the prevalence of their age, gender, incidence of traditional vascular risk factors (diabetes, hypertension and dyslipidemia) and the incidence of recurrent MIs. However, there should be further studies pertain to flow dynamics, cellular and biochemical aspect of these patients to elaborate this observations and associations in a large scale study setting.

The treatment of CAE is still controversial due to lack of strong evidences. Some experts suggest that long-term anticoagulation therapy for these patients [18] while others recommend only antiplatelets for symptomless individuals. However, most of our patients who had recurrent NSTEMIs were treated with combine use of single antiplatelet and warfarin. Some research has proven that these ectatic vessels are likely to have vasospasm and the treatment with calcium channel blockers or nitrates may be beneficial [19]. Alternatively, the usage of nitrates has been found to worse the ischemia in some studies [20]. Bearing in mind that the CAE is associated with atherosclerosis and the treatment with lipid lowering drugs has been highlighted as beneficial to them [21]. Therefore, all patients in our study were treated with statin therapy.

One of the other challenges encountered during the management of these patients are the difficulties in catheter based coronary interventions to the associated symptomatic coronary plaque lesions. Interventional cardiologists can come-across several technical difficulties during angioplasty and stent implantation in these vessels in relation to the stent size selection, achieving adequate stent expansion and issues related to stent thrombosis. However, the long term benefits of these stent strategies in patients with CAE are not adequately proven [22]. Therefore, surgical revisualization has been practiced for many years for the treatment of ectatic patients with multi-vessel coronary plaque disease.

Even though a well-established evidence based treatment strategy is not available to treat this condition, physicians should be mindful of making an individualized decision on what potential medications and interventional strategies are likely to be beneficial to these patients.

CONCLUSION

CAE is one of a less frequent etiology for acute coronary syndrome. RCA is frequently affected vessel and it is more often associated with atherosclerotic plaque disease. Addition to that those patients are found to have high preponderance to get recurrent NSTEMIs. However, many unanswered questions remain concerning their etiopathology, association with other vascular risk factors, prognosis and treatment modalities. Therefore, further prospective multicenter studies with long-term follow up are essential to elaborate these particular subset of patients with CAE.

Limitations of the study

We would like to point out some of the limitations of our study. Firstly, the study is restricted by its cross-sectional nature of patients attending to a single center, and the relatively small sample size would encounter more selection bias to the study. However, our institute has a wide range of population drainage from various parts of the country as the center is one of a main interventional cardiology center in Sri Lanka. Secondly, the current study was conducted as a retrospective analysis of patients with angiograms having ectaic coronary arteries. Thus, the information regarding the future outcomes related to this phenomenon is limited. Therefore, further multicenter long term follow-up studies are needed to investigate the treatment measures and prognosis of these patients with CAE.

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Conflict of interest

The authors declare that they have no conflict of interest.

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