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The Demographic and Clinical Profile of Patients Undergoing Coronary Chronic total Occlusion (CTO) Intervention in a teaching hospital in Kerala From the CTO Investigators- Kerala (CTOI-K) Group

Authors
Dr Gopakumar K S, Dr Mathew Iype, Prof Sunitha Viswanathan, Prof. George Koshy, Prof Prabha Nini Gupta, Prof V V Radhakrishnan

ABSTRACT

Objectives: *Coronary CTO interventions have become a common practice with a prevalence of 3.8-10 % in patients undergoing percutaneous coronary interventions (PCI). There are innumerable studies on CTO interventions. But studies on the patient demographics and background clinical presentations are lacking. This study, planned to bridge this gap.*

Materials and Methods: *This was a single center prospective study of a cohort of all patients undergoing percutaneous coronary intervention (PCI) as elective or adhoc procedure for CTO from august 2014 to june 2015.Only antegrade CTO interventions were included*

Results: *It was a prospective study of a cohort of all patients undergoing PCI as elective or adhoc procedure for CTO. A total of 210 (8.9% of total PCI (2353) during the study period) CTO patients were followed up. The mean age of the patients was 56.54 +/- 8.9 % with 63.3 %(n= 133) below the age of 60 .In the cohort females were only 19% (n= 40).Diabetes mellitus was seen in 33.8%(n= 71) , systemic hypertension in 52.4% (n=110) and 47.1% (n=99) were smokers. In the study 32.9% (n=69) had chronic stable angina(CSA), 22.9 %(n= 48) had UA/NSTEMI and 44.2% (n= 93) had STEMI. Left anterior descending coronary artery (LAD) was involved in 36.7% (n= 77), Right Coronary Artery (RCA) in 48.1% (n= 101), and Left Circumflex Coronary Artery (LCX) in 15.2% (n= 32). The J-CTO score in the cohort was J- CTO≤1 in 13.3% (n=28) J- CTO = 2 in 50.5 % (n=106) and J- CTO ≥ 3 in 36.2% (n= 76).*

Conclusions: *This is the first prospective CTO interventional study from Kerala state. Our data shows that Kerala has a relatively younger predominantly males, smokers and hypertensive population having coronary CTOs requiring revascularization. This points to a malignant atherosclerotic tendency in this population and calls for population preventive strategies.*

1. INTRODUCTION

Coronary Total Occlusions (CTOs) has been classically defined as 100% luminal diameter stenosis with Thrombolysis in Myocardial Infarction (TIMI) flow 0 and assumed to be for more than 3 months duration.[1,2] Coronary CTO interventions have become a common practice with a prevalence of 3.8-10 % in patients undergoing percutaneous coronary interventions (PCI).[3,4] CTO interventions were historically associated with a high rate of procedural complications[3,4,5]. But with the improvement in technology and operator skills the complication rate has come down[5,6]. Several studies have

demonstrated that successful CTO revasculari-zation has translated into better cardiovascular outcomes and improved quality of life.[6,7,8] European Society of Cardiology guidelines assigned a class IIa (level of evidence B) to CTO PCI in 'patients with expected ischaemia reduction in a corresponding myocardial territory and/or angina relief[10.] World- over presently about 70% of CTO interventions are successful[5,9,11.]

There are innumerable studies on CTO intervene-tions. But studies on the patient demographics and background clinical presentations are lacking. This study, planned to bridge this gap.

2. METHODS

It was a prospective study of a cohort of all patients undergoing PCI as elective or adhoc procedure for CTO in the department of Cardiology Government Medical College, Thiruvananthapuram from August 1st 2014 to June 30th 2015

2.1 Inclusion criteria

All patients undergoing PCI as elective or adhoc procedure for CTO were included in the study. CTO is defined as a high-grade coronary occlusion with reduced antegrade flow (Thrombolysis in Myocardial Infarction [TIMI] grade 0 flow) with estimated duration of at least 3 months

2.2. Exclusion criteria

Exclusion criteria included patients with an estimated CTO duration less than 3 months, CTO vessel size $\leq$ 2.5 mm , in-stent total occlusion, status post Coronary Artery Bypass Graft surgery (CABG), Chronic Kidney Disease (CKD) with a baseline e GFR < 30 ml/min/1.73 m^2, retrograde approach for CTO, inability to take antiplatelets and left ventricular ejection fraction less than 30 %.

2.3. Definitions

CTO was defined as coronary lesion having 100% luminal diameter stenosis, with TIMI 0 flow and assumed to be more than 3 months old. Procedural success after PCI treatment was defined as residual stenosis <50 % and TIMI 3 flow.

All patients was pre-treated with aspirin and clopidogrel (a loading dose of 300 mg at least 6 h before the procedure).After the procedure, all patients were on dual antiplatelet therapy with aspirin and one of clopidogrel or prasugrel or ticagrelor. Baseline characteristics procedural and angiographic characteristics were recorded. The patients were taken up for CTO intervention.

3. RESULTS

3.1 Baseline patient characteristics

A total of 210 (8.9% of total PCI (2353) during the study period) CTO patients were followed up. The mean age was 56.54+/- 8.9. The patient demographics are shown in table 1

Table 1: Patient demographics

		Number	Percentage
Age	≤60	133	63.3
	>60	77	36.7
Male Gender		170	81.0
Diabetes mellitus		71	33.8
Systemic Hypertension		110	52.4
Smoking history		99	47.1

3.2. Baseline cardiac profile

In the study 32.9% (n=69) had Chronic stable Angina, 22.9 %(n= 48) had UA/NSTEMI and 44.2% (n= 93) had STEMI. see table 2. In those with history of ACS, 64.78% (n=92) had ACS during the previous year and remaining 35.22% (n=49) had ACS prior to that. Majority of the patients were in New York Heart Association (NYHA) functional class (FC) II and III (Angina-89.04% Dyspnoea-95.7%). Table 3 shows the baseline cardiovascular profile.

Table 2: Presenting history of ACS

Past ACS	Number	Percentage
None	69	32.9%
STEMI	93	44.3%
Unstable angina/ NSTEMI	48	22.9%

Table 3: Baseline cardiovascular profile

		Frequency	Percentage
Time from ACS	0	69	32.9
	3-6 MONTHS	75	35.7
	6-12 MONTHS	17	8.1
	>12 MONTHS	49	23.3
Previous PCI	No	177	84.3
	PCI for different vessel	22	10.5
	PCI for same vessel	2	1.0
	Attempted PCI for the same vessel	9	4.3
Calcium	None	104	49.5
	Mild	38	18.1
	Moderate	43	20.5
	Severe	25	11.9
Length of CTO			
	<10	57	27.1
	10-20	90	42.9
	>20	63	30.0
Collateral	None	1	.5
	Bridging	98	46.7
	Homo	84	40.0
Distal reformation	None	7	3.3
	Poor	96	45.7
	Good	107	51.0

3.3 Coronary Artery Involvement

Left Anterior Descending Coronary artery (LAD) was involved in 36.7% (n= 77), Right Coronary Artery (RCA) in 48.1% (n= 101), and Left Circumflex Coronary Artery (LCX) in 15.2% (n= 32). The J-CTO score in the cohort was J- CTO≤1 in 13.3% (n=28), J- CTO = 2 in 50.5 % (n=106) and J- CTO ≥ 3 in 36.2% (n= 76). Coronary involvement in CTO is shown in table 4

Table 4: Coronary involvement in CTO

		Frequency	Percentage
Number of vessels involved	1	84	40.0
	2	93	44.3
	3	33	15.7
Target vessel involved in CTO	LAD	77	36.7
	RCA	101	48.1
	LCX	32	15.2

3.4 Nature of CTO

The nature of the CTO lesions is given in Table 5

Table 5: Nature of CTO Lesion

		Frequency	percentage
Size of index CTO vessel	2.5-2.9	94	44.8
	3.0-3.9	113	53.8
	>4	3	1.4
Ending of CTO	Blunt	162	77.1
	Tapering	48	22.9
Site of CTO	Ostial	26	12.4
	Proximal	81	38.6
	Mid	77	36.7
	Distal	26	12.4

DISCUSSION

A majority of patients in this study were relatively young. The mean age was 56. In a comparative large Italian study the mean age was 62.[12] Nineteen percent of patients were women this is similar to the trend seen globally. In a multinational registry published by Claessen et al[14], women constituted 14%.

In our study we found a higher proportion of patients undergoing CTO intervention were current smokers. In contrast data from the National Cardiovascular Registry of the United States had a lower proportion of CTO patients who were smokers[13]. The prevalence of systemic hypertension in our study was lower compared to the US National Cardiovascular Registry while that of diabetes mellitus was similar.[13.]

In our study 67 % had history of ACS which was considerably higher than the Canadian multi centre registry which had only 40% of the patients who had history of ACS probably because of lack of access to immediate interventional facilities for a large population of ACS patients in the kerala setting.[4]

Table 6: Major atherosclerotic factors in present study compared to National Cardiovascular Registry data (USA)[13].

	Current study (south India)	National cardiovascular registry (USA)
Systemic hypertension	52.4%	86%
Diabetes mellitus	33.8%	33.8%
Smoking	47.1%	23%

CONCLUSIONS

This is the first prospective CTO interventional study from Kerala state. Our data shows that Kerala has a relatively younger and predominantly male population having coronary CTOs requiring revascularization. The incidence of smoking is high and might have contributed to the problem. More than 2/3rd of the patients had a past history of ACS. This points to a malignant atherosclerotic tendency in this population and calls for population preventive strategies.

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