

# Influence of Previous Acute Coronary Syndrome on the Outcome of Percutaneous Coronary Intervention for Chronic Total Occlusion Lesion

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## ABSTRACT

**Background:** Chronic Total Occlusion (CTO) intervention is a challenging area in coronary interventions. Incomplete revascularization results in increased morbidity and mortality. The influence of past CAD category- whether stable effort angina, unstable angina / NSTEMI and STEMI, on success of CTO intervention has not been studied in the past. The present study aims to bridge this gap in knowledge

**Materials and methods:** This was a single center, prospective, observational cohort study. It was conducted from August 1<sup>st</sup> 2014 to June 30<sup>th</sup> 2015 and followed up for a period of 6 months.

**Results:** Sixty nine (32.9%) had Chronic stable Angina, 48 (22.9 %) had UA/NSTEMI and 93 (44.2%) had STEMI. See figure1. In those with history of ACS (acute coronary syndrome), 64.78% (n=92) had ACS during the previous year and remaining 35.22% (n=49) had ACS prior to that. Procedural success in those with history of Chronic stable angina and no ACS was 72.5 % (n=50) and in UA/NSTEMI was 52% (n=25) and in those with STEMI was 73 % (n= 68); p .025.

**Conclusions:** The procedural success was higher in patients who had STEMI or stable effort angina in the past. The fact that CTO intervention success rate in stable effort angina was equal to that in patients who had old STEMI was interesting. It was less in patients who had unstable angina and NSTEMI

**Keywords:** Chronic Total Occlusion, Percutaneous coronary interventions

## 1. INTRODUCTION

Coronary chronic total occlusions (CTO) are defined as an occluded coronary segment with Thrombolysis in Myocardial Infarction (TIMI) flow 0 for  $\geq 3$  months duration. [1,2] Coronary CTOs are not uncommon, with a prevalence rate of 18–52% among patients undergoing coronary angiography. [3] Current data suggests that successful CTO revascularization improves cardiovascular outcomes. [4] The Joyal meta-analysis of CTO interventions showed that successful treatment was associated with a

significant improvement in mortality compared to unsuccessfully treated patients. [5]

The European Society of Cardiology guidelines assigned a class II a (level of evidence B) to CTO PCI in ‘patients with expected ischemia reduction in a corresponding myocardial territory and/or angina relief’. [6] Current world data suggests that about 70% of CTO interventions are successful. However, incomplete revascularization results in worse morbidity and mortality. [7]

The influence of past CAD category-whether stable effort angina, unstable angina / NSTEMI and STEMI, on success of CTO intervention has not been studied in the past. The present study aims to bridge this gap in knowledge.

## 2. MATERIALS AND METHODS

### 2.1 The Study

This was a single center, prospective, observational cohort study. It was conducted from August 1<sup>st</sup> 2014 to June 30<sup>th</sup> 2015 and followed up for a period of 6 months. The study was conducted at the Department of Cardiology, Government Medical College Thiruvananthapuram, India. All patients undergoing PCI as elective or adhoc procedure for CTO in the department of Cardiology Government Medical College, Thiruvananthapuram from August 1<sup>st</sup> 2014 to June 30<sup>th</sup> 2015 were included.

### 2.2 Inclusion criteria

All patients undergoing PCI for CTO by antegrade approach in the department of Cardiology Government Medical College, Thiruvananthapuram from August 1<sup>st</sup> 2014 to June 30<sup>th</sup> 2015.

### 2.3 Exclusion criteria

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

### 2.4 Definitions

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.

Procedural success was defined as successful CTO recanalization with achievement of < 30% residual diameter stenosis within the treated segment and restoration of TIMI grade-3 antegrade flow

### 2.5 Ethical concerns and Consent

Ethical clearance was obtained from the Human Ethics Committee, Government Medical College Trivandrum. Informed written consent was obtained from the patients.

### 2.6 Drug therapy

All patients received loading dose of aspirin 300 milligram (mg), clopidogrel 300 mg and atorvastatin 80 mg prior to PCI. Dual antiplatelets were continued for one year. During the procedure unfractionated heparin (UFH) was given.

## 3. RESULTS

### 3.1. Baseline demographics

A total of 210 (8.9% of total PCI (2353) during the study period) CTO patients were followed up for a period of 6 months, mean age was 52, out of which 63.3% were less than 60 years of age.

### 3.2 CAD profile

In the cohort 32.9% (n=69) had Chronic stable Angina, 22.9% (n= 48) had UA/NSTEMI and 44.2% (n= 93) had STEMI. See figure1. 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 NYHA FC II and III (Angina- 89.04% Dyspnoea-95.7%).

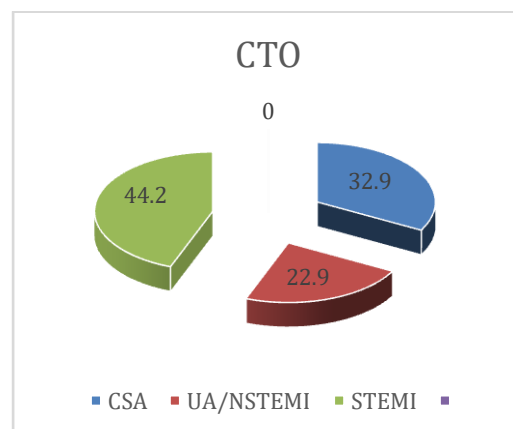


Figure 1: CAD profile of patients undergoing CTO intervention

### 3.3 Procedural success in patients with ACS versus no ACS

Procedural success in those with history of Chronic stable angina and no ACS was 72.5 % (n=50) and in UA/NSTEMI was 52% (n=25) and in those with STEMI was 73 % (n- 68); p .025. See figure 2.

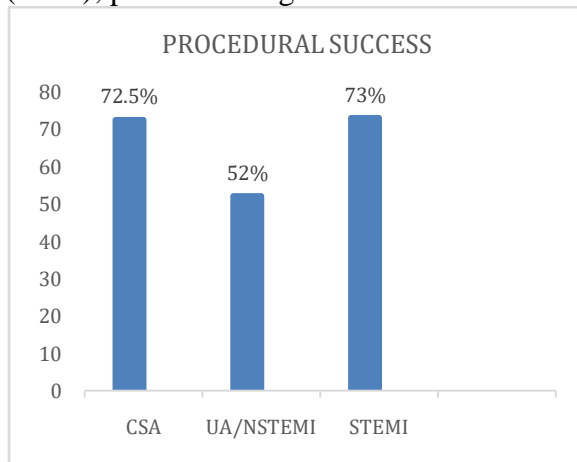


Figure 2: Procedural success in patients with stable effort angina, Unstable angina/ NSTEMI and STEMI

### 3.4. Procedural success and length of time lapsed from past ACS (acute coronary syndrome)

Procedural success was seen in 70.65% (n= 65) of those who had history of ACS in the previous year and 57.14 % (n= 28) in those who had ACS prior to one year; p-0.025. See figure 3.

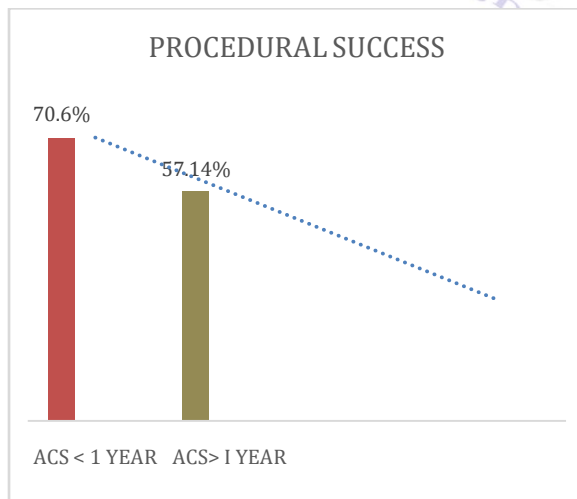


Figure -3

## DISCUSSION

CTO intervention was most successful in patients who had history of STEMI or stable effort angina. It was least successful in patients who had history of NSTEMI or unstable angina.

The initial atherosclerotic plaque in unstable angina is complex and frequently ulcerated. [8] When it leads on to chronic total occlusion, the plaque morphology is even more complicated. Hence successful recanalization of CTO following unstable angina and NSTEMI will be more challenging and hence had least successful CTO intervention much lower than those with CSA or STEMI who had more favourable plaque morphology.

The STEMI patients and CSA patients had shorter CTO length compared to NSTEMI/UA patients who had longer CTO length which contributed to higher success rate in the former [10]

Procedural success was also determined by the time from the index episode of acute coronary syndrome. Those patients with history of ACS with index episode >1 year had significantly lower procedural success compared to those with history of ACS with index episode <1 year (57.14% vs 70.6%, p -0.025). Probably because of increased calcium burden of the plaque as the plaque ages. [9,10]

## CONCLUSIONS

The field of CTO interventions has been revolutionized with success rates over 70%. The procedural success was higher in patients who had STEMI or stable effort angina in the past. The fact that CTO intervention success rate in stable effort angina was equal to that in patients who had old STEMI was interesting. It was less in patients who had unstable angina and NSTEMI. When all ACS patients were analyzed, patients who had any ACS within the past one year had higher chance of successful revascularization.

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