

A RETROSPECTIVE DESCRIPTIVE STUDY ANALYSIS OF FREQUENCY OF TOTALLY OCCLUDED CORONARY ARTERIES IN PATIENTS OF STABLE IHD UNDERGOING ROUTINE CORONARY ANGIOGRAPHY

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ABSTRACT

Objective: To assess the current burden/frequency of chronic coronary total occlusions in patients with stable ischemic heart disease undergoing angiography at Army cardiac centre Lahore.

Study Design: Descriptive cross sectional study.

Place and Duration of Study: Army cardiac centre Lahore from Jan 2016 to Dec 2016.

Material and Methods: This is a retrospective descriptive study analysis of the record of 2441 patients who came to Army Cardiac Centre Lahore (ACC) for coronary angiography during the year of 2016. Patient's data with completely (100%) occluded arteries (CTO) was analysed for age, gender, specific coronary artery occluded and co-morbidities like diabetes. The data was obtained from ACC registry and then tabulated.

Results: Out of 2441 patients 1753 were found to have stable IHD. Out of these 463 patients were found to have completely occluded arteries. Most common occluded artery was found to be proximal RCA followed by proximal LAD. About 84.7% patients with chronic coronary occlusion were males and 30.4% had diabetes.

Conclusion: Analysis of data revealed that 26.4% of patients with stable ischemic heart disease undergoing coronary angiography had completely occluded coronary arteries which indicate a significant burden, especially considering the morbidities, mortality and therapeutic challenges associated with CTO.

Keywords: Chronic occluded coronary arteries, Coronary angiography, Chronic total occlusion, Interventional cardiology, Ischemic heart disease, Percutaneous intervention, RCA occlusion.

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INTRODUCTION

Ischemic heart disease is the leading cause of mortality worldwide, claiming more than 8 million lives in 2015 according to the world health organization statistics. The recent advances in the emergency care, catheter based percutaneous interventions and improved post-op care has led to a decrease in the proportion of fatal myocardial infarctions as compared to the non-fatal incidents. Ischemic heart disease is also associated with significant morbidities in patients causing significant impairment to life. One of the challenging problems faced by interventional cardiologists is the chronic totally occluded coronary arteries (CTO). It has been recognized by some as the final frontier of interventional cardiology because it leads to different

therapeutic challenges as compared to the non-total occlusions. It also causes increased incidence of significant morbidities including angina¹ and left ventricular pump failure². As a result of the new technological advances, the success rate of successful PCI is around 75%-80%. However due to the therapeutic challenges CTO is one of the commonest reasons for failure to do PCI ultimately leading to an increase in the need of coronary artery bypass grafting procedures³. It is hence a topic of significant scientific research in modern interventional cardiology. The purpose of this study was to assess the burden of CTO to determine the magnitude of this problem.

Operational Definitions

CTO:

- 100% luminal stenosis with no antegrade flow, known or assumed to be >12 week duration on the basis of previous angiogram or lesions with significant bridging collaterals.

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- Totally occluded coronary arteries of unknown duration with rentrop 2-3 retrograde filling.

MATERIAL AND METHODS

This descriptive cross sectional study was conducted at the Army Cardiac Center Lahore to assess the frequency of CTO lesion in patients undergoing routine coronary angiography. We included 2441 patients who underwent coronary angiography routine and had stable ischemic heart disease for a period of 1 year between 1st January to 31st December 2016. The patients clinical characteristics were tabulated

(NSTEMI) and ST segment elevation myocardial infarction (STEMI) were identified and excluded from the sample. The patients with previous CABG and those with acute coronary syndrome (NSTEMI=STEMI) were excluded and 1753 patients were identified as those with stable ischemic heart disease undergoing coronary angiography.

RESULTS

Out of 1753 stable IHD patients, 463 (26.4%) had coronary CTO. A total of 606 occluded vessels were identified with some patients having more than one CTO lesions. A total of 1290

Table: Frequency (%) of vessels causing CTO (n=606).

Vessels	n (%)
Right coronary Artery(RCA)	
Proximal RCA	111 (18.3%)
Middle RCA	77 (12.7%)
Distal RCA	27 (4.4%)
PLV/PDA	17 (2.8%)
RCA Total	232 (38.2%)
Left Anterior Descending (LAD)	
Proximal LAD	88 (14.5%)
Mid LAD	111 (18.3%)
Distal LAD	9 (1.4%)
Diagonal	16 (2.6%)
LAD Total	224 (36.8%)
Left Circumflex(LCX)	
Proximal LCX	67 (11%)
Distal LCX	36 (5.9%)
OM-Branched	47 (7.7%)
LCX Total	150 (24.7%)

retrospectively from a 1 year data obtained from Army Cardiac Center Lahore registry. The data included in the study includes patients characteristics like age, gender, total, number of vessels involved, distribution of CTO lesions among specific branches of coronary arteries, the sub-segment of those branches involved (proximal or distal), patients with more than one CTO lesions and comorbidities like diabetes mellitus. Patients with previous coronary artery bypass graft (CABG) procedure or patients with non ST segment elevation myocardial infarction

patients had non total occlusions of coronary arteries.

The most commonly involved vessel was the right coronary artery with 38.3% of the total lesions. Left anterior descending was the second most common location of CTO (36.8%) with middle LAD being the most common site in LAD. A total of 24.6% lesions were located in LCX. This study is unique in that it also measures the relative prevalence of CTO lesions in different coronary arteries as shown in fig-1. A more detailed analysis is given in the table.

CTO was identified more commonly in males with 392 out of 462 (84.7%). The range of age was 30-93 years. About 30.4% patients were reported to be diabetics as shown in fig 2 & 3.

DISCUSSION

The recent advances in diagnostic and therapeutic procedure in the field of interventional cardiology have lowered the morbidity and mortality associated with cardiac disease and have led to an overall improved functional status of patients with coronary artery disease. Newer PCI techniques and stents have led to a decrease in in-hospital major cardiac adverse events including in-hospital death, Q wave MI and transient ischemic attacks⁴.

CTO lesions are uncharted territory in the field of interventional cardiology because of the therapeutic challenges associated with it. CTO PCI is a complex procedure and has a high operator dependency. It has a long learning curve. The procedural time for CTO PCI is longer than a non CTO PCI leading to prolonged occupation of the catheter lab, increased fluoro time and a higher contrast dosage requirements compared to the non CTO PCI. And this leads to significant occupation of financial and human resources. The equipment for CTO PCI is costly due to the use of multiple guide wires and different types of micro catheters from those used in non CTO stenting e.g. stingray balloon, caravel micro catheter, corsair micro catheter. Due to these issues many patients with CTO lesion go untreated and are ultimately referred for coronary artery bypass surgery. Although costly, but this new equipment e.g sting-ray balloon, caravel super-cross microcatheter etc, for CTO PCI has made the procedure more feasible and successful thereby reducing the need for coronary artery bypass graft surgery.

Coronary CTO lesions in patients with ischemic systolic failure are associated with a higher mortality and a worse prognosis than those with non CTO lesions⁵. There is also an increased incidence of ventricular arrhythmias in patients who have ischemic cardiomyopathy with

CTO lesions than those with non total occlusions⁶

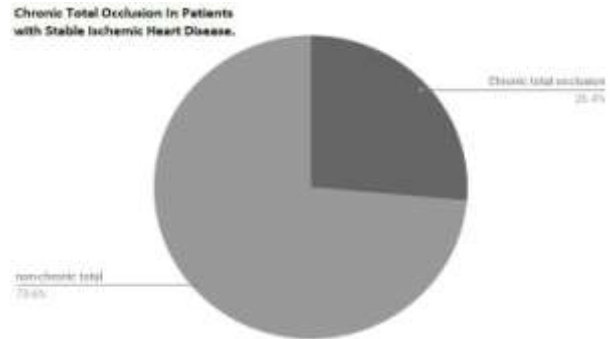


Figure-1: CTO Frequency in stable IHD.

which increases the risk of sudden cardiac death.

However successful CTO recanalization has to be beneficial for the patient as it is associated

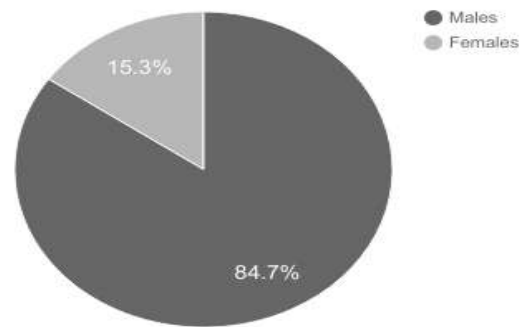


Figure-2: Gender distribution in CTO.

with a reduced all cause mortality and improved long term survival compared to those with failed CTO PCI or those with untreated CTO lesions^{7,8,1}.

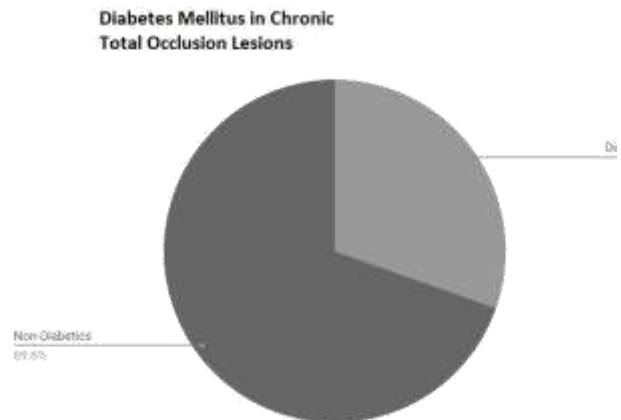


Figure-3: Diabetes Mellitus in CTO patients.

It improves the overall cardiac function by restoring the appropriate myocardial supply

thereby increasing the LV ejection fraction and decreasing the end systolic volume in IHD patients, specially when there is ischemia of the area supplied by the CTO vessel². The amount of collaterals of the CTO vessel also impact the overall survival specially in a non CTO related STEMI patient⁹.

CTO PCI is beneficial as it lowers the risk for coronary artery bypass graft surgery^{3,1}. Studies show that patients with total occlusion who are diabetic are at an increased risk of being adversely affected by it as compared to the nondiabetics due to a worse vascular status, hence PCI in diabetics yields better results and a reductions in adverse cardiac effects⁸.

Successful recanalization of CTO vessels leads to improved quality of life with reduction in symptoms of myocardial ischemia and pump failure due to restoration of myocardial perfusion. According to a meta analysis carried out⁶, different studies showed a reduction in angular symptoms after successful recanalization¹.

Recent studies show that the current rate of CTO PCI performed ranges between 3-10% among the total PCI done for stable IHD¹⁰. Studies also show that the rate of successful PCI done for CTO lesions is around 75-80%^{3,8,11}. The current observation of 26.4% prevalence of CTO lesions indicates the magnitude of this problem and a huge potential for improvement.

CONCLUSION

CTO lesions having a high frequency of 26.4% in stable IHD patients undergoing coronary angiography indicate the significant burden of this pathology. The difficulties approaching it therapeutically due to multiple factors like operator dependency & longer occupation of catheter lab often leads to failure to do PCI in CTO lesions. But the high burden of CTO lesions, the increased morbidities and mortality associated with it and with the recent studies showing positive response to successful

recanalization warrants further research on this topic along with development of newer therapeutic modalities and allocation of time and resources to treat it.

CONFLICT OF INTEREST

This study has no conflict of interest to be declare by any author.

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