

FREQUENCY OF SIGNIFICANT CORONARY ARTERY DISEASE IN CASES WITH ST SEGMENT DEPRESSION DURING RECOVERY PHASE OF EXERCISE

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Abstract: *Coronary Artery Disease (CAD) imposes physical, social, and economic burden. It is amongst the leading causes of mortality and morbidity. Exercise-induced ST segment depression is considered reliable ECG finding for the diagnosis of obstructive coronary atherosclerosis. Exercise testing has an excellent safety record. The aim of the study is to determine the frequency of significant coronary artery disease in cases with ST-segment depression during recovery phase of exercise tolerance test. This descriptive case series was carried out at the Department of Cardiology, Rehmatul-Lil-Alamin Institute of Cardiology, Lahore, from 11-01-2021 to 10-07-2021. A total of 89 patients were taken in this study. Conventional coronary angiography via femoral or radial route was performed. Lesions were quantified by QCA technique in addition to visual assessment. Significant CAD was labelled as per operational definition. Patients ranged between 30-70 years of age with mean age of 51.8±10.8 years. There were 56 males (62.9%) while remaining 33 (37.1%) were females. History of diabetes mellitus was reported in 31 patients (34.8%), hypertension in 38 patients (42.7%) and smoking 51 (57.3%). Family history of CAD found in 46 patients (51.7%). Hyperlipidemia reported in 38 patients (42.7%). Significant CAD was observed in 76 patients (85.4%). Stratification for age, gender, diabetes mellitus, hypertension and smoking were carried out and found no association with significant CAD. In conclusion, 85.4% frequency rate of significant coronary artery disease in cases with ST segment depression during recovery phase of exercise tolerance test was observed. Thus, careful evaluation of ST segment depression occurring in recovery phase may add significantly to the clinical information derived from the results of ETT.*

Keywords: Significant coronary artery disease, ST Segment depression, Exercise tolerance test

Introduction

Ischemic heart disease remains a major public health problem and its number is on the rise in developing as well as developed world. Coronary Artery Disease (CAD) can increase the physical, social and economic burden to a great extent and also add to further morbidity and mortality in such cases (Khan et al., 2016; Nazar et al., 2017).

There are number of risk factors for this, including male gender, older age, Diabetes Mellitus (DM), Hypertension (HTN), Smoking, dyslipidemia, hyperuricemia etc. with varying degree of association (Chou and Physicians*, 2015; Krishnan et al., 2016). Clinical symptoms include chest pain associated with nausea, sweating and palpitations. Angiography is the investigation of choice for diagnosis, but we can increase its utility in targeted population narrowed down by Exercise tolerance test (ETT) (Miller et al., 2016). Exercise tolerance test is an initial test with good utility in early detection of obstructive coronary

atherosclerosis. It has an excellent safety record. Mortality is less than 0.01% and morbidity is less than 0.05%. It is safe and non-invasive method to predict CAD with good sensitivity. It can be subdivided into two phases, i.e. the exercise phase and recovery phase. ST depression is commonly seen in cases during exercise phase but still few cases can present in recovery phase (Srivatsa et al., 2020).

According to a study done by Narayanpillai et al ST segment depression in recovery phase was seen in 12% of the cases and on further stratification significant coronary artery disease was observed in 86.7% of the cases (Narayanapillai et al., 2015).

ETT is proved as a good modality in previous studies for detection of CAD, but data mostly focuses on active phase of the test. Data regarding recovery phase of the test is scarce. That's why this study is planned to quantify the local data and if it is found that there is significant association between ST depressions



in recovery phase to CAD, monitoring focus can also be extended to this phase as well.

Methodology

This current descriptive case series was conducted at the Department of Cardiology, Rehmatul-Lil-Alamin Institute of Cardiology, Lahore from 11-01-2021 to 10-07-2021. The sample size was calculated as 89 by keeping the confidence interval equal to 95% and the margin of error equal to 7% and the anticipated prevalence of significant coronary artery disease in cases with ST segment depression in recovery phase of ETT as 86.7% in previous study (Narayanapillai et al., 2015).

The cases of both genders and age 30-70 years presenting for exercise tolerance test and having ST segment depression as per operational definition in recovery phase of ETT were included through non-probable consecutive sampling. Patients with ST depression during exercise phase, any arrhythmias during ETT, baseline ST depression on resting ECG or anaemia - Hb <10.0g/dl were excluded from the study.

Approval was gained from the local ethical review committee of the hospital. After that, the cases were included as per selection criteria and an informed consent was taken from all subjects to include in study and to collect data. The data were collected in the form of gender (male/female), age (years), DM (yes/no), HTN (yes/no), smoking (yes/no), and recorded on a specially designed proforma. After baseline ECG these patients underwent for exercise tolerance test where continuous ECG monitoring was done and the cases that complete active exercise phase were observed for recovery period i.e., 15 minutes after exercise and continuous ECG monitoring was done to look for ST- segment depression as per operational definition. Those having ST segment depression in recovery phase as per definition underwent coronary angiography and significant coronary artery disease was labelled as per operational definition. Conventional coronary angiography via femoral or radial route was performed by experienced operator (assistant professor of Cardiology) and reporting was also done by Assistant Professor of Cardiology. Lesions were quantified by QCA technique in addition to visual assessment. Significant CAD was labelled as per operational definition. All these results were noted and recorded on the same proforma.

The data were analyzed by using SPSS-version 23.0. Quantitative variables were presented as mean ± SD (Standard Deviation) for quantitative variables like age. Frequency & percentages were calculated for nominal data like gender, DM, HTN, smoking and outcome variables i.e. Significant CAD. Effect modifiers were controlled through stratification of

gender, age, DM, HTN and smoking to see the effect on outcome variable. Post stratification chi square test was applied. P-value ≤0.05 was taken as significant.

Results

Patients ranged between 30-70 years of age with mean age of 51.8±10.8 years. There were 56 males (62.9%) while remaining 33 (37.1%) were females (Figure 1).

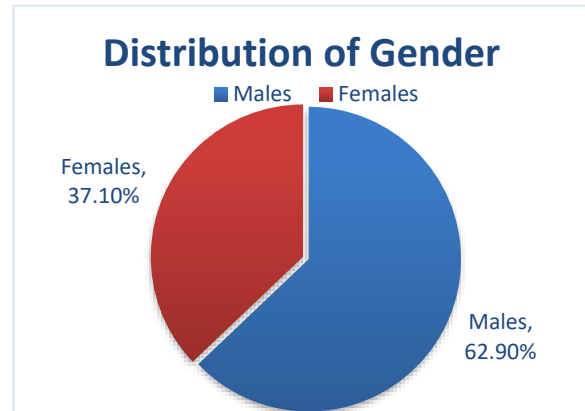


Figure: 1

History of diabetes mellitus was reported in 31 patients (34.8%), hypertension in 38 patients (42.7%) and smoking 51 (57.3%). Family history of CAD found in 46 patients (51.7%). Hyperlipidemia reported in 38 patients (42.7%). Significant CAD was observed in 76 patients (85.4%) (Figure 2).

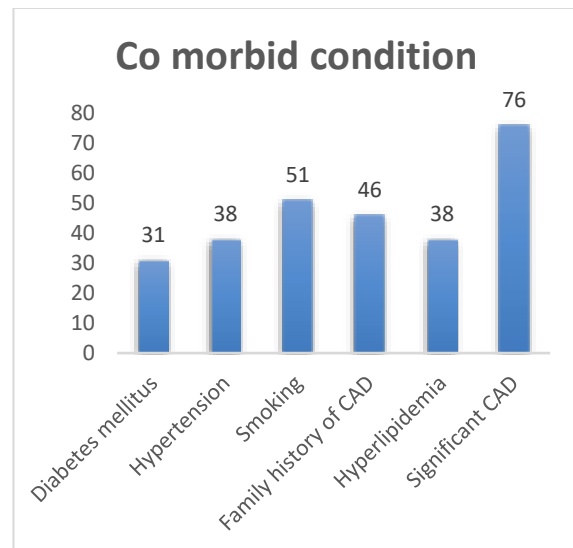


Figure: 2

Stratification for age, gender, diabetes mellitus, hypertension and smoking were carried out and found no association with significant CAD.

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Table1: Stratification for age, gender, diabetes mellitus, hypertension and smoking

Factor	Constructs	Significant CAD		Total	P-value
		Yes	No		
Age	30-50	39	7	46	0.866
	51-70	37	6	43	
Gender	Male	46	10	56	0.258
	Female	30	3	33	
DM	Yes	26	5	31	0.766
	No	50	8	58	
HTN	Yes	35	3	38	0.122
	No	41	10	51	
Smoking	Yes	44	7	51	0.785
	No	32	6	38	

Discussion

Coronary Artery Disease (CAD) imposes physical, social and economic burden. It is amongst the leading causes of mortality and morbidity (Edition, 2010). Standard care for patients presenting to emergency room with chest pain is admission to coronary care unit (Ashley et al., 2001). This results in fairly large number of unnecessary admissions because only one-third of these are found to have coronary artery disease.

Exercise-induced ST segment depression is considered reliable ECG finding for the diagnosis of obstructive coronary atherosclerosis (Ishtiaq et al., 2002; Members et al., 2002; Shrief and Zaman, 2002). Exercise testing has an excellent safety record (Sharieff and Khan, 2002). Mortality is less than 0.01% and morbidity is less than 0.05%. Risk is less for low-risk patients, who are seen in emergency and undergo exercise testing for risk stratification (Soto et al., 2001).

While the diagnostic and prognostic value of ST segment depression during exercise in ETT is well recognized, only a few studies have investigated the clinical importance of ST segment depression during the recovery phase of ETT (Savage et al., 1987).

Whether ST segment depression in recovery phase alone adds to positive predictive value of ETT was not proved to be true as the data suggest that the diagnostic value of ST segment depression only in recovery phase of exercise stress test is almost similar to ST segment depression occurring during exercise phase of ETT. Although it increased the sensitivity, positive predictive value was same. The reason for appearance of ST segment depression in the recovery phase rather than exercise is unclear.

So as in previous studies, it could not be predicted clinically. This also highlights that recovery only ST

segment depression has frequent occurrence. So, if patients develop ST segment depression during recovery phase of ETT, this should also be carefully assessed in patients of suspected or documented CAD and should be prolonged to at least 5 minutes and more, if needed (Kavi, 2021).

In current study, frequency of significant coronary artery disease in cases with ST segment depression during recovery phase of exercise tolerance test was found to be 85.4%. Our findings are in agreement with a study conducted by Jayaprasad et al, they demonstrated that prevalence of significant coronary artery disease (CAD) was in 86.7% of recovery ST segment depression.

Conclusion

In conclusion, 85.4% frequency rate of significant coronary artery disease in cases with ST segment depression during recovery phase of exercise tolerance test was observed. Thus, careful evaluation of ST segment depression occurring in recovery phase may add significantly to the clinical information derived from the results of ETT.

Conflict of interest

The authors declared an absence of conflict of interest.

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