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Peri-Operative Assessment of Rhythm Disturbance in Chronic Coronary Syndrome Patients Undergoing Ophthalmic Operations Detected by Holter Monitoring

Mohamed Adel Attia [1]; Wasem Omar Omar Ahmed [1]; Akram El-gazzar [2]; Dalia Khaled Sharaf [1]*

[1] Department of Cardiology, Damietta Faculty of Medicine, Al-Azhar University, Damietta, Egypt.

[2] Department of Ophthalmology, Damietta Faculty of Medicine, Al-Azhar University, Damietta, Egypt.

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***Corresponding author**

Email: dr.daliakhaled1@gmail.com

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Abstract

Background: Chronic coronary syndrome [CCS] refers to a clinical spectrum of symptoms and signs related to myocardial ischemia due to progressive coronary artery disease. There is emerging clinical evidence that the presence of a CCS has a proarrhythmic effect. The aim of this study was to assess rhythm disturbance in chronic coronary syndrome patients undergoing ophthalmic operations.

Patients and Methods: This cross-sectional comparative study conducted at Ophthalmology department at Al-Azhar university hospital – New Damietta in the period from June 2023 to July 2024 on 100 patients who are scheduled to undergo ophthalmic operations divided into two matched groups for age and sex; group [A] included 50 patients who were diagnosed as chronic coronary syndrome as a study group [their mean ages were 58.9 ± 9.2 years] and group [B] included 50 patients who had no previous history of cardiac diseases as a control group [their mean ages were 56.4 ± 4 years].

Results*:* Infrequent PVCs were the most common abnormal finding observed in group A preoperatively and postoperatively [12% and 20% respectively]. While intraoperatively, the most common observed abnormality was sinus tachycardia [38%]. In group B, throughout the study the most frequent abnormality observed was sinus tachycardia. It was observed in 16%, 40%, and 32%, preoperative, intraoperative, and postoperative respectively. DM and HTN were the independent predictors of arrhythmia and patients with DM or HTN more susceptible for perioperative arrhythmia

Conclusion: Patients with CCS are at higher risk for perioperative rhythm disturbance than normal population. This risk increases in patients with DM and HTN and they are more susceptible for perioperative arrhythmia.

Keywords: Chronic Coronary Syndrome; Arrhythmia; Oculocardiac Reflex.

INTRODUCTION

Coronary artery disease [CAD], also known as ischemic heart disease [IHD], involves inadequate blood supply to the myocardium due to atherosclerotic plaque in the epicardial arteries or microvascular arterioles. Patients may have chronic [stable] or acute [unstable] forms of the disease [1].

In 2019, the European Society of Cardiology [ESC] updated guidelines, reclassifying "stable coronary artery disease" [SCAD] as "chronic coronary syndrome" [CCS], and dividing CAD into acute coronary syndrome [ACS] and chronic coronary syndrome [CCS] [2].

Complications related to CCS include arrhythmias such as atrial fibrillation and ventricular arrhythmias. Several mechanisms contribute to the development of arrhythmias in CCS, including myocardial fibrosis, autonomic nervous system imbalance, and abnormal calcium handling [3].

Arrhythmia is a potential risk during ocular surgery, individuals who possess a history of cardiovascular disease, hypertension, or arrhythmias are more susceptible to experiencing arrhythmia during ocular surgery. Administration of anesthesia and the use of epinephrine in local anesthesia may alter the electrical activity of the heart, which can lead to arrhythmias [4].

It is essential for medical professionals to evaluate patients before ocular surgery to take preventative measures to mitigate the risks associated with arrhythmia [5].

The oculocardiac reflex [OCR] is a phenomenon that can occur during ophthalmic surgery or trauma, in which pressure is applied to the eyeball or surrounding areas, resulting in a reflex decrease in heart rate. This reflex is mediated by the ophthalmic division of the trigeminal nerve, which sends signals to the brainstem, leading to activation of the parasympathetic nervous system and subsequent bradycardia. While the OCR is a benign reflex, it has been associated with the development of arrhythmias in some cases [6].

Careful attention must be paid to preoperative cardiovascular assessment to identify patients at high risk of cardiovascular complications. Once identified, cardio-vascular risk reduction is achieved through optimization of medical conditions, appropriate management of medications, and careful monitoring to allow for early identification and early intervention for-any new conditions that would increase the risk of adverse cardiovascular outcomes [7].

Holter monitoring enhances the possibility of observing cardiac rhythm during symptoms and can detect arrhythmias in asymptomatic patients [8].

Given that patients undergoing ophthalmic operations are often at risk of perioperative rhythm disturbances, understanding how CCS contributes to arrhythmias during these procedures is critical. This research is vital for developing tailored preoperative assessment and management strategies for CCS patients, reducing perioperative complications and improving patient outcomes.

THE AIM OF THE WORK

The aim of this study is to assess rhythm disturbance in chronic coronary syndrome patients undergoing ophthalmic operations.

PATIENTS AND METHODS

This was a cross-sectional comparative study conducted at Ophthalmology department at Al-Azhar university hospital – New Damietta on 100 patients who were scheduled to undergo ophthalmic operations admitted at Ophthalmology department between June 2023 to July 2024.

Before the start of the study, permission was obtained from the Ethical Committee in the faculty of medicine, Al-Azhar University.

In addition, informed oral consents were obtained from the patients included in the study. They were divided into 2 equal groups matched for age and gender as following:

Group [A] [The study group]: included 50 patients who were scheduled to undergo ophthalmic operations and had been diagnosed as having chronic coronary syndrome according to the following diagnostic criteria and confirmed by 12 lead ECG, echocardiography and/or functional imaging:

- Symptomatic patients with reproducible stress-induced angina.
- Patients with angina or ischemia caused by epicardial vasomotor abnormalities or functional/structural microvascular alterations in the absence of epicardial obstructive CAD [ANOCA/INOCA].
- The non-acute patient post-ACS or after a revascularization.
- The non-acute patient with heart failure [HF] of ischemic origin.

The asymptomatic individuals in whom epicardial CAD was detected during an imaging tests for refining cardiovascular risk assessment, screening for personal or professional purposes, or as an incidental finding for another indication.

Group [B]: included 50 patients who were scheduled to undergo ophthalmic operations and had no previous history of cardiac diseases as a control group.

The patients with malignant arrhythmia, recent MI/ACS, valvular heart disease, and non-ischemic cardiomyopathy which were confirmed by 12 lead ECG and/or Echocardiography were excluded from the study.

Full history taking: Detailed medical history was obtained from all selected patients with emphasis on history of Risk Factors of CAD including hypertension, diabetes mellitus, dyslipidemia and obesity, and past history of any chronic medical disease including ischemic heart disease, congestive heart failure, valvular heart disease, previous stroke or transient ischemic attacks and any chronic drug use especially antiarrhythmic or antipsychotic drugs.

Full thorough General and local cardiac examination: with special emphasis on pulse, blood pressure, neck veins, lower limb, body weight, chest and abdominal examination.

Laboratory Investigations: the routine laboratory workup including complete blood count, liver, kidney function tests, lipid profile, iron profile, Na+, K+, Ca++, Po4- and PTH. Perioperative laboratory investigations including complete blood count [CBC], Fasting blood glucose and HA1C, Kidney function & liver function, Lipid profile including HDL, LDL, total cholesterol and TG3, Coagulation profile, and viral markers were done for all patients.

Pre-operative resting baseline standard 12 lead Electrocardiogram was done for all included patients.

Conventional Echo Doppler study was done for all patients by a commercially available echocardiography system [Philips EPIQ diagnostic ultrasound system, Bothell WA 98021 USA] using an X5-1 phased array transducer. All patients were studied in left lateral position with special look for the following parameters: left ventricular internal dimensions, ejection fraction and resting segmental wall motion abnormalities.

Holter monitoring: Holter device [GE SEER™ 1000] was placed for all selected patients for 6 hours before the operation, intra-operative and for 6 hours after the operation.

Statistical Analysis:

The data were collected, organized and tabulated using SPSS [statistical package for social science] computer software version. 13.0, on an IBM compatible computer. For quantitative data, mean and standard deviation were calculated. For comparison between two means, students [t] test was used. For comparison between the values of a parameter at two different intervals, paired [t] test was used. For categorical data, chi was calculated when appropriate. For interpretation of results, P value was considered significant when it equal or less than 0.05.

RESULTS

Regarding demographic data, our analysis revealed that 56% of the patients in group A were female, compared to 50% in group B, with no statistically significant difference between the two groups. Similarly, no significant difference was observed in the ages of patients between the groups, with an average age of 58.9 ± 9.2 years in group A and 56.4 ± 4 years in group B.

Regarding risk factors, our results revealed statistically significant differences between group A and group B with higher incidence of comorbidities [Smoking, DM, HTN and dyslipidemia] in group A compared to group B. There was no statistically significant difference between both groups regarding family history.

Regarding echocardiographic findings, our results showed that patients of group A were having significantly lower in EF and LVEDD compared with those in group B while they have statistically significant higher LVESD compared to those in group B. There was no statistically significant difference between both groups regarding other echocardiographic findings as shown in table [1].

Regarding wall motion findings, our results showed that 72% of patients in group A and 100% of patients in group B had no segmental wall motion. While, 28% of patients in group A had wall motion abnormality as hypokinesia in different segments of the heart with statistically significant difference as shown in table [2].

Regarding baseline ECG findings, abnormal ECG findings were observed in 54% of patients in group A and 14% of patients in group B with a statically significant difference. The most common ECG abnormality observed in group A was pathological Q wave [16% of patients] as shown in table [3].

Regarding preoperative Holter findings, our results showed that no changes were observed in 56% and 74% of patients in both group A and B respectively. While abnormal findings were observed in 44% and 26% in both group A and B respectively as shown in figure [1].

Regarding intraoperative Holter findings, our results showed that no changes were observed in 26% and 34% of patients in both group A and B respectively. While abnormal findings were observed in 74% and 66% were observed in both groups respectively with a statistically significant difference. Sinus tachycardia was the most common abnormal finding observed in both group A and B [38% and 40% respectively] as shown in figure [2].

Regarding postoperative Holter findings, our results showed that no changes were observed in 54% and 66% of patients in both group A and B respectively with no statistically significant difference between the two groups. Frequent PVCs were the most common abnormal finding observed in group A while, sinus tachycardia was the common finding observed in group B [20% and 32% respectively] as shown in figure [3]. DM and HTN were the independent predictors of arrhythmia and patients with DM or HTN more susceptible for perioperative arrhythmia.

Table [1]: Comparison of Echocardiographic data between studied groups

	Group A		Group B		P value
	Mean	SD	Mean	SD	
IVS	10.6	0.9	10.4	0.7	0.3
LVEDD	51.4	2.8	54.1	2.2	0.0001*
LVESD	37.6	3.8	33.2	2.5	0.0001*
PW	9.9	0.9	9.8	0.6	0.5
EF	58.9	5.2	66.1	2.4	0.0001*
LA	41.1	3.3	40.3	1.6	0.1

Table [2]: Comparison of Wall motion findings between studied groups

	Group A		Group B		P value
	N	%	N	%	
No segmental wall motion	36	72%	50	100%	0.006*
Hypokinesia of apex & related segment	6	12%	0	0%	
Hypokinesia of LAD territory	1	2%	0	0%	
Hypokinesia of Inferior and posterior wall	3	6%	0	0%	
Hypokinesia of antaro septum and anterior wall	3	6%	0	0%	
Hypokinesia of apico lateral and apico anterior wall	1	2%	0	0%	

Chi square test; * significant

Table [3]: Comparison of baseline ECG findings between studied groups:

	Group A		Group B		P value
	N	%	N	%	
Normal ECG	23	46 %	43	86 %	<0.001
Pathological Q wave	8	16 %	0	0 %	
LBBB	3	6 %	1	2 %	
Inverted T-wave in anterior leads	2	4 %	2	4 %	
Inverted T-wave in inferior leads	3	6 %	0	0 %	
PACs	2	4 %	2	4 %	
PVCs	4	8 %	2	4 %	
ST depression 1/2 ml in Inferior leads.	2	4 %	0	0 %	
ST depression 1 ml in inferolateral leads	2	4 %	0	0 %	
ST depression & Biphasic T-wave Inf. Leads	1	2 %	0	0 %	

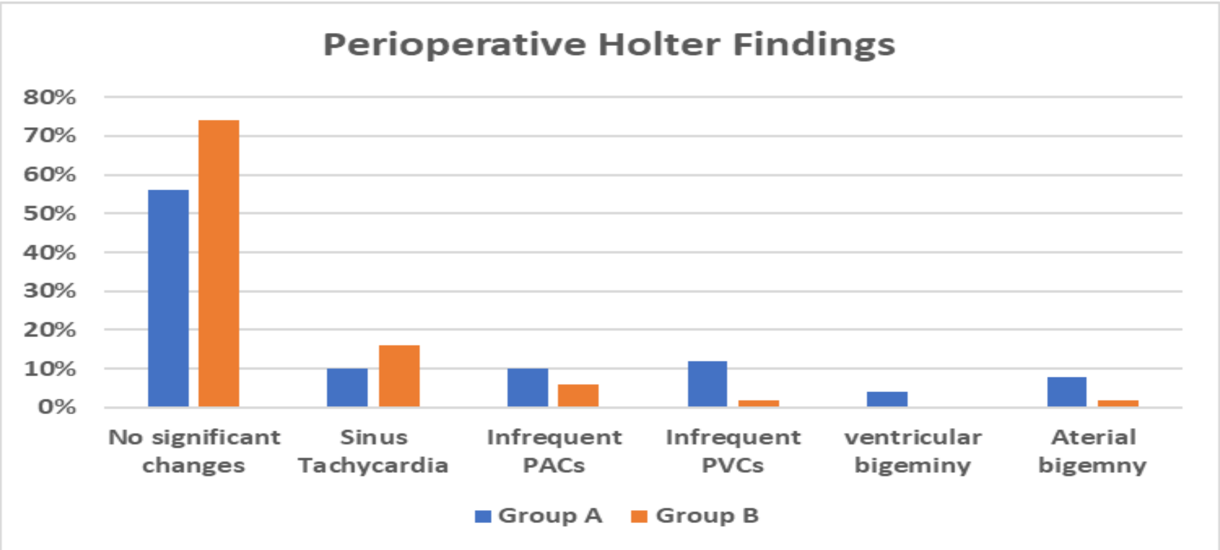

Figure [1]: Comparison of Pre-Operative Holter findings between studied groups

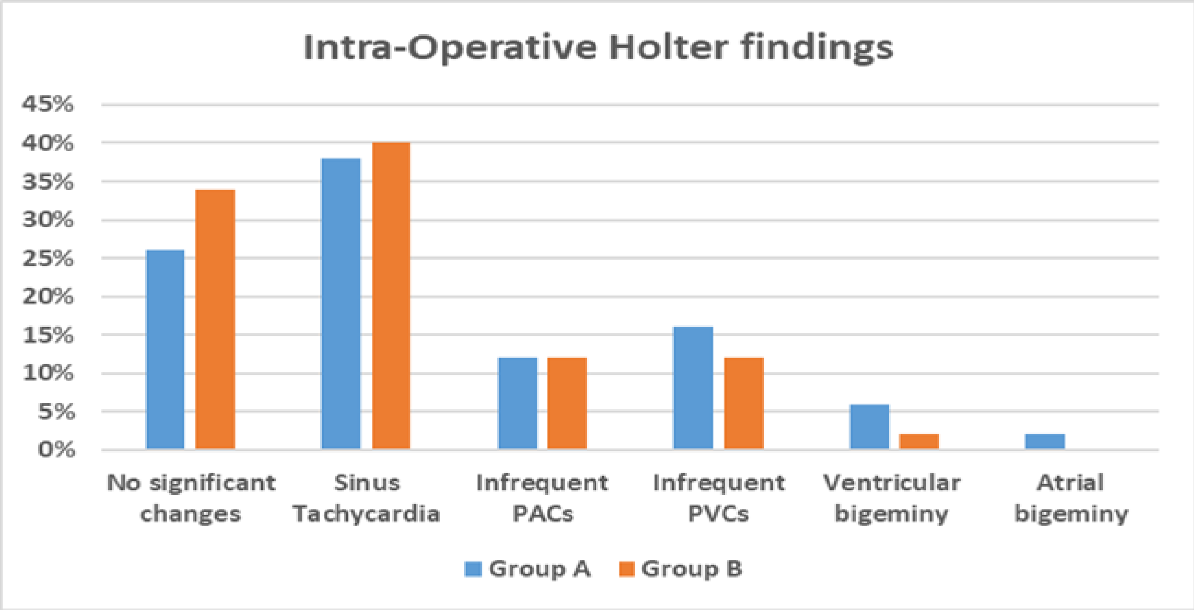

Figure [2]: Comparison of Intra-Operative Holter findings between studied groups

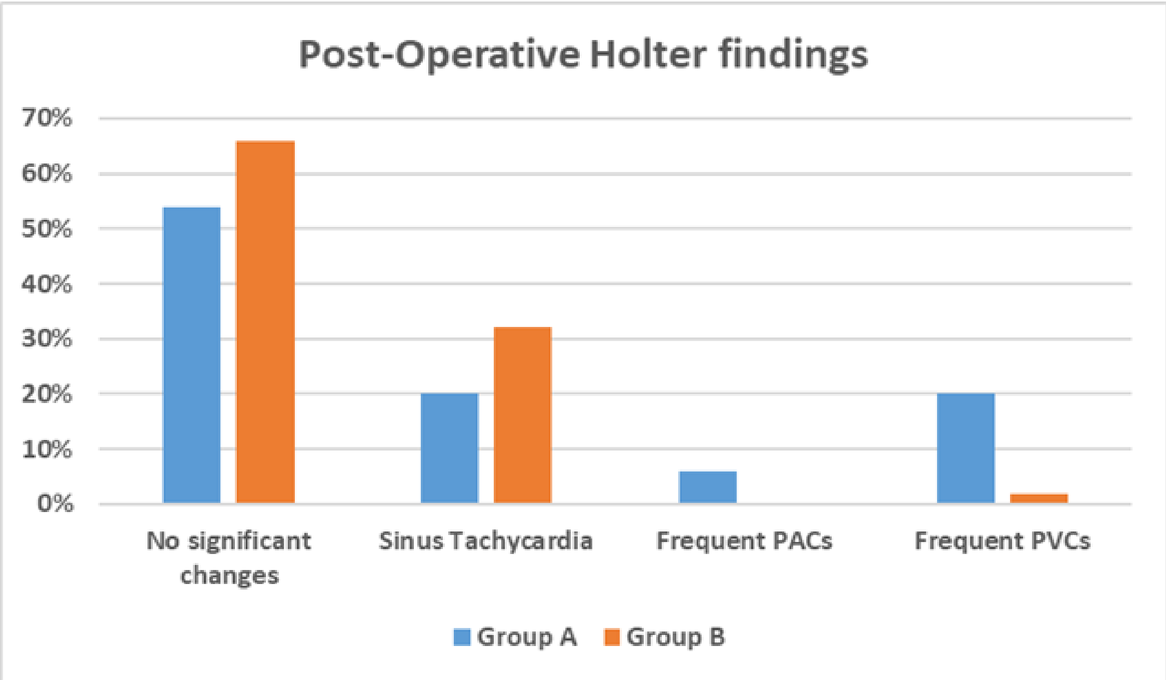

Figure [3]: Comparison of Post-Operative Holter findings between studied groups

DISCUSSION

Infrequent PVCs were the most common abnormal finding observed in group A preoperatively and postoperatively [12% and 20% respectively]. While intraoperatively, the most common observed abnormality was sinus tachycardia [38%].

In line with our finding was study done by Alexander [9], which reported that the most common type of arrhythmia observed in patients undergoing ocular surgery under local anesthesia was isolated extrasystole particularly in older patients, and sustained ectopic cardiac arrhythmias were observed in 4-6 per cent of patients of all ages.

These findings can be explained by that ocular surgeries in cardiovascular disease patients, including CCS-like populations, pose significant risks of perioperative cardiac arrhythmias, primarily driven by the oculocardiac reflex [OCR] and autonomic disturbances. The arrhythmic changes observed can be also attributed to administration of anesthesia and the use of epinephrine in local anesthesia which may alter the electrical activity of the heart, and lead to arrhythmias [10].

In group B, throughout the study the most frequent abnormality observed was sinus tachycardia. It was observed in 16%, 40%, and 32%, preoperative, intraoperative, and postoperative respectively. In consistency with our findings was the review study done by Nadeem, and Sandeelo [10]. They reported that Majority of perioperative arrhythmias were supraventricular in origin with sinus tachycardia being the most common followed by atrial fibrillation as the most frequent in general surgery as well as ocular surgery.

This sinus tachycardia is of multifactorial origin, first is physiological stress as surgery triggers a stress response, leading to the release of catecholamines [like adrenaline], which increase heart rate. Second is pain, postoperative pain or during the procedure can stimulate the sympathetic nervous system, leading to tachycardia and lastly increased sympathetic activity because of invasive procedures, surgical stress, or anesthesia may activate the sympathetic nervous system, resulting in increased heart rate [11].

Although, Oculocardiac reflex [OCR] is a phenomenon defined by bradycardia or dysrhythmia commonly caused by the traction on the extra ocular muscle, which, through the ophthalmic branch of trigeminal nerve, stimulates the vagal center.

The afferent arm of the reflex is the ophthalmic branch of the trigeminal nerve, and the efferent arm is the vagus nerve, which diminishes sinoatrial node impulses and leads to bradycardia [12], no bradycardia was observed in any patients included throughout the study. This can be explained by usage of topical anesthesia This topical anesthesia demonstrates better heart rate variability [HRV] indices, fewer ischemic episodes, and more stable blood pressure compared to retro bulbar or general anesthesia, making it preferred for cardiovascular compromised patients [13].

In conclusion, DM and HTN were the independent predictors of arrhythmia and patients with DM or HTN more susceptible for perioperative arrhythmia.

Disclosure: authors declare that there was no conflict of interest or financial disclosure.

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