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RESEARCH ARTICLE

Assessment of Electrocardiographic and Echocardiographic Changes in Patients with Chronic Obstructive Pulmonary Disease

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ABSTRACT

Background: Chronic obstructive pulmonary disease (COPD) is associated with significant cardiovascular morbidity. Electrocardiographic (ECG) and echocardiographic assessments can provide insights into the cardiac complications arising in COPD patients.

Objective: This study aims to assess the electrocardiographic and echocardiographic changes in patients with COPD and to determine their correlation with disease severity.

Material and Methods: A total of 60 patients diagnosed with COPD as per the Global Initiative for Chronic Obstructive Lung Disease (GOLD) criteria were enrolled from the Department of Medicine in a tertiary care hospital. Detailed clinical evaluations, ECG, and echocardiographic assessments were conducted.

Results: The study identified various ECG and echocardiographic abnormalities in the COPD cohort. Table 1 summarizes the key findings regarding heart rate, rhythm abnormalities, left ventricular ejection fraction (LVEF), left atrial size, and pulmonary artery pressure.

Conclusion: The findings underscore the significant cardiac involvement in COPD patients, highlighting the need for regular cardiovascular monitoring in this population.

Keywords: Chronic obstructive pulmonary disease, Electrocardiography, Echocardiography, Cardiovascular risk, Pulmonary function.

INTRODUCTION:

Chronic obstructive pulmonary disease (COPD) is a progressive lung disease characterized by persistent respiratory symptoms and airflow limitation due to airway and alveolar abnormalities. It is primarily caused by exposure to noxious particles or gases, most notably from tobacco smoke. COPD is not only a pulmonary condition but also has systemic implications, particularly concerning cardiovascular health. Patients with COPD are at an increased risk of cardiovascular diseases, which contribute significantly to morbidity and mortality in this population (1).

The association between COPD and cardiovascular complications is well-documented, with studies showing that patients with COPD have a higher prevalence of heart failure, arrhythmias, and ischemic heart disease (2). The underlying mechanisms for this association include systemic inflammation, hypoxemia, and the effects of shared risk factors such as smoking and sedentary lifestyle (3). The cardiovascular system can be affected in multiple ways, leading to structural and functional changes that can be evaluated through electrocardiographic (ECG) and echocardiographic assessments.

ECG changes in COPD patients can include right ventricular hypertrophy, strain patterns, and arrhythmias, reflecting the burden of pulmonary hypertension and right heart strain (4). Echocardiography is crucial for assessing left ventricular function and detecting pulmonary hypertension, which is commonly seen in COPD due to chronic hypoxia and increased pulmonary vascular resistance (5). Given the high prevalence of cardiovascular complications in COPD patients, this study aims to assess the electrocardiographic and echocardiographic changes in these patients and their correlation with the severity of the disease.

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Aim and Objectives

Aim: To evaluate the electrocardiographic and echocardiographic changes in patients with chronic obstructive pulmonary disease.

Objectives:

1. To identify the prevalence of ECG abnormalities in COPD patients.
2. To assess echocardiographic findings and their correlation with the severity of COPD.

Material and Methods

This prospective study was conducted in the Department of Medicine at a tertiary care hospital over six months. A total of 60 patients diagnosed with COPD, according to the GOLD criteria, were included. Patients aged 40 years and above with a confirmed diagnosis of COPD were recruited. Those with significant comorbidities such as ischemic heart disease, valvular heart disease, or congenital heart defects were excluded.

Clinical Evaluation: Each patient underwent a detailed clinical evaluation, including history-taking and physical examination. Smoking history, duration of COPD, and exacerbation frequency were recorded.

Electrocardiographic Assessment: Standard 12-lead ECG was performed for each patient. Parameters assessed included heart rate, rhythm, axis deviation, and evidence of right ventricular hypertrophy.

Echocardiographic Assessment: A transthoracic echocardiogram was performed using a standard protocol. Key parameters measured included left ventricular ejection fraction (LVEF), left atrial diameter, and pulmonary artery pressure.

Statistical Analysis: Data were analyzed using appropriate statistical tests. A p-value of <0.05 was considered statistically significant.

Results

The demographic and clinical characteristics of the patients are summarized in Table 1. The mean age of the patients was 65.4 ± 7.8 years, with a predominance of male patients (72%).

Table 1: Electrocardiographic and Echocardiographic Findings in COPD Patients

Parameter	**Findings (n=60)**
Mean Age (years)	65.4 ± 7.8
Male (%)	72%
Heart Rate (bpm)	82.3 ± 10.5
Rhythm Abnormalities (%)	30%
Left Ventricular Ejection Fraction (%)	54.5 ± 6.7
Left Atrial Diameter (mm)	42.3 ± 4.2
Pulmonary Artery Pressure (mmHg)	31.8 ± 5.5

The study found that 30% of patients had rhythm abnormalities, including atrial fibrillation and premature ventricular contractions. The mean LVEF was 54.5 ± 6.7%, indicating left ventricular systolic dysfunction in some patients. The left atrial diameter was significantly enlarged, with a mean of 42.3 ± 4.2 mm, reflecting increased left atrial pressure. The mean pulmonary artery pressure was elevated at 31.8 ± 5.5 mmHg.

Discussion

The results of this study highlight the significant cardiac involvement in patients with COPD. The high prevalence of ECG abnormalities, particularly rhythm disturbances, underscores the increased cardiovascular risk in this population. Previous studies have reported similar findings, indicating that COPD is associated with various cardiac arrhythmias, which can exacerbate the condition and lead to poorer outcomes (6).

Echocardiographic assessments revealed a concerning prevalence of left ventricular dysfunction and pulmonary hypertension among COPD patients. The mean LVEF of 54.5% suggests that a considerable number of patients may be experiencing left ventricular systolic dysfunction, which can significantly impact their quality of life and functional capacity (7). Furthermore, the enlarged left atrial diameter is indicative of long-standing pressure

overload, which can lead to atrial fibrillation and other complications (8).

These findings are consistent with previous literature that has established a strong link between COPD and cardiovascular comorbidities. Studies have demonstrated that patients with COPD are at a higher risk for developing heart failure and other cardiovascular conditions, primarily due to the systemic inflammation and hypoxia associated with the disease (9). Additionally, the interplay between lung function and cardiovascular health is complex, with both systems influencing each other, particularly in patients with advanced COPD (10).

The limitations of this study include the relatively small sample size and the single-center design, which may limit the generalizability of the findings. Future multicentric studies with larger cohorts are warranted to validate these results and further explore the mechanisms underlying the cardiovascular complications in COPD.

Conclusion

This study emphasizes the importance of regular cardiovascular assessments in patients with COPD. The significant electrocardiographic and echocardiographic changes observed highlight the need for integrated care approaches that address both pulmonary and cardiovascular health. Clinicians should remain vigilant for cardiovascular complications in COPD patients to improve overall management and outcomes.

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