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ORIGINAL ARTICLE / ОРИГИНАЛНИ РАД

Electrocardiographic predictors of five-year mortality in chronic obstructive pulmonary disease patients

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SUMMARY

Introduction/Objective Cardiovascular disease is one of the most common comorbidities among subjects with chronic obstructive pulmonary disease (COPD). The aim of this study is to evaluate electrocardiogram (ECG) parameters and mortality predictors in COPD patients.

Methods A total of 835 consecutive patients were included. The patients were classified to suffer from COPD if the forced expiratory volume in the first second (FEV1) and forced vital capacity (FVC) was < 70% in three consecutive postbronchodilator measurements. The following ECG changes were observed: axis, P wave, low ORS complex, transitional zone, left bundle branch block (LBBB), right bundle branch block (RBBB), incomplete RBBB, S1S2S3 configuration, negative T in V1–V3. The patients were followed up for mortality over a five-year period.

Results Both survivors and non-survivors were of similar age, sex, and COPD status. FVC and FEV1, as well as Global Initiative for Chronic Obstructive Lung Disease stadiums were significantly higher in the survivor group ($p < 0.016$, $p < 0.001$, $p < 0.001$, respectively). Normal axis was in significantly higher percentage in non-survived patients ($p = 0.020$). RBBB and incomplete RBBB are more frequent findings in patients who died ($p < 0.001$, $p < 0.05$, respectively). LBBB, S1S2S3 configuration is in significantly higher percentage present in non-survivors ($p < 0.016$, $p < 0.001$, respectively). In the multivariable logistic model, patients with LBBB have two times higher chance of mortality compared to patients without LBBB. In contrast, patients with RBBB have 1.6 times lower chance of having death outcome.

Conclusion The main ECG predictors of COPD patients' five-year mortality are LBBB and RBBB, but according to statistical model, ECG should be further explored and possibly obligatory involved in a routine clinical practice as an easy and low-cost screening method.

Keywords: chronic obstructive pulmonary disease; electrocardiography; mortality

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a very common, preventable and treatable disease, characterized by respiratory symptoms and airflow limitation due to airway and/or alveolar abnormalities, caused by significant exposure to noxious particles or gases [1]. It is the fourth leading cause of death worldwide, exceeded only by myocardial infarction, malignancy, and stroke [2]. Among chronic high morbidity and mortality diseases throughout the world, many aged people suffer from COPD and die prematurely [2, 3]. COPD complexity and mortality are increased by its exacerbations and co-morbidities [4]. Along with pulmonary involvement, there are significant extra pulmonary effects in COPD [3, 4, 5]. COPD can influence electrocardiographic (ECG) changes variously.

COPD is often associated with cardiovascular diseases, thus representing one of the most frequent and clinically important coexisting conditions. An accumulating body of evidence indicates COPD association with coronary artery disease (CAD), chronic heart failure, hypertension, and cardiac arrhythmias, independent of shared risk factors [6, 7]. Apart from the common risk factors presence (age, smoking habit, environmental pollutants, sex, and diet), it appears that multiple pathophysiologic abnormalities contribute to both the COPD and CAD development and progression. COPD and CAD association is characterized by specific ECG abnormalities [5, 6, 7].

Changes of Sokolow–Lyon index and clockwise rotation of the horizonal QRS axis are some of the changes. ECG changes can be found in different stages of COPD and can be associated with the increased death risk. An increased burden of cardiac arrhythmias has also been recognized recently [5]. In COPD, various mechanisms can influence ECG diversely, independent of a possible CAD [6]. The most consistent patterns reported have been vertical axes for P and QRS and increased P wave amplitude (P-pulmonale). The QRS amplitudes are often reduced. Previous studies have related ECG findings with obstruction and emphysema and

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increased pulmonary vascular pressure or right ventricular hypertrophy (RVH). However, none of these studies have linked their findings to the combined effects of obstruction, emphysema, and increased afterload [5, 6]. COPD comorbidities have been infrequently studied, mostly in evaluating relationships between COPD and some specific diseases.

The current study was aimed at finding a correlation between ECG changes and COPD, as well as at mortality in relation to ECG [6, 7]. Regular pulmonologist examination does not include ECG. However, ECG could be the first marker of COPD – approachable, easy to perform, and inexpensive, but extremely helpful.

METHODS

A prospective study was conducted from January 2009 to February 2014 at the Zemun Clinical Hospital Center and included 835 COPD patients. COPD cases were diagnosed and selected from patients who were attending the Outpatient Department of Respiratory Diseases for treatment of various respiratory problem. Exclusion criteria were any kind of cardiovascular diseases (previous myocardial infarction, arterial hypertension, angina pectoris, congenital cardiovascular disease, heart failure, etc.) Also, patients who were not able to adequately perform spirometry were excluded.

Spirometry was performed using Turninac pneumotach Pony FX (Cosmed Srl, Rome, Italy), following the American Thoracic Society / European Respiratory Society (ATS/ERS) recommendations using postbronchodilator values in order to overestimate the prevalence of COPD [8]. The ATS/ERS recommendations for chronic obstructive lung disease have defined airflow obstruction if forced expiratory volume in the first second (FEV1) and forced vital capacity (FVC) ratio is < 0.7 of predicted. Airflow obstruction severity was graded according to Global Initiative for Chronic Obstructive Lung Disease (GOLD) 2011 as Stage 1 – mild, Stage 2 – moderate, Stage 3 – severe, and Stage 4 – very severe; characterized by FEV1 the values are > 80% of predicted, 50–80% of predicted, 30–50% of predicted, and < 30% of predicted, respectively [8]. All the patients were smokers.

All of the patients underwent ECG. A 12-lead ECG (CARDIOVIT AT-102; SCHILLER Americas Inc., Doral, FL, USA), including three bipolar limb leads, three unipolar limb leads, and six unipolar precordial leads, was performed. All necessary precautions advised for ECG were observed. ECG was done in the supine position. ECG parameters were measured using the Minnesota Code, by two independent persons, and their final judgement was achieved by consensus in case of disagreement [9].

The P value axis and QRS complex were calculated according to the Cabrera system [9]. The following parameters were monitored: high, peaked wave ≥ 2.5 mm tall in leads II, III, aVF; RVH – right axis deviation of + 110° or more; dominant R wave in V1 (> 7 mm tall or R/S ratio > 1); dominant S wave in V5 or V6 (> 7 mm deep or R/S ratio < 1); QRS duration < 120 ms); left bundle branch block (LBBB) (the QRS duration ≥ 120 ms, QS or rS complex in lead V1, notched ('M'-shaped) R wave in lead V6), incomplete RBBB (RSR' pattern in V1–V3 with QRS duration < 120 ms), abnormal transitional zone (poor R wave progression or "poor anterior R wave progression"), S1S2S3 pattern (presented with S waves in leads I, II, and III and negative T wave changes in V1–V3). The patients were followed up for five years for the mortality prediction calculations.

The study protocol was approved by the Ethics Committee of the Faculty of Medicine, University of Belgrade. All the procedures were performed in accordance with the Helsinki declaration. All the patients have given their written informed consent to participate in the study.

Statistical analysis

The results are presented as count (%), mean ± standard deviation or median (25–75th percentile). Group differences were analyzed using parametric (independent samples t-test) and non-parametric tests (Mann–Whitney U-test, Pearson's χ^2 test, and Fisher's exact test). Logistic regression analysis was performed to assess independent predictors of mortality. All data were analyzed using IBM SPSS Statistics, Version 20.0 (IBM Corp., Armonk, NY, USA). All p-values < 0.05 were considered statistically significant.

RESULTS

The patients were divided in relation to exitus into two groups – those who survived the five-year period and those who died, as well as according to their sex. The minimum observed age was 42 years, the maximum age was 84 years, and the mean age (SD) was 63.4 (8.8) years. FVC was statistically higher in non-survivors (70.9 ± 14.8) with regard to surviving patients (68 ± 15.3). Also, FEV1 was statistically higher in persons who died than in the surviving ones (44.3 ± 10.7, 41.4 ± 11.7, respectively). FEV1/FVC ratio was statistically higher in non-survivors than in survived patients (63.8 ± 60.4–65.8; 63.1 ± 56.9). There was no statistical difference in MEF 25–75 between the two groups. GOLD stadiums 2, 3, and 4 were statistically higher in the surviving group. General characteristics and lung function of COPD patients separately for five-year survivors and non-survivors are presented in Table 1.

As shown in Table 1, both survivors and non-survivors are of similar age, sex, and COPD status. In contrast, FVC and FEV1 are significantly higher in the survivor group. FEV1/FVC is significantly higher in the survivor group, but the difference in medians is small. Most of the patients were in GOLD stadium 3, in whom higher mortality than in GOLD stadiums 2 and 4 was observed.

Normal axis was statistically higher in non-survived patients. Left axis deviation was found in 24.4.9% of non-survivors and in 75.6% of patients who survived the five-year period. Tall, peaked P wave > 2.5 mm in height was described in inferior leads for 30.7% of non-survivors and in 69.3% of survivors. The patients who had no RVH had statistically lower percentage of five-year mortality. In contrast, RBBB, as well as incomplete RBBB, was a statistically higher finding in patients who died. Low QRS was found in

Table 1. General characteristics of chronic obstructive pulmonary disease patients in relation to exitus

Characteristics	Death in five years		p
	No	Yes	
Age (years)	63.3 ± 8.3	63.8 ± 9.1	0.409[a]
Sex			
male	78 (29.5%)	186 (70.5%)	0.918[b]
female	203 (29.2%)	492 (70.8%)	
FVC (%)	70.9 ± 14.8	68.0 ± 15.3	0.007[a]
FEV1 (%)	44.3 ± 10.7	41.4 ± 11.7	< 0.001[a]
FEV1/FVC	63.8 (60.4-65.8)	63.1 (56.9–65.4)	< 0.001[c]
MEF (%)	13.0 (10.5–19)	14.6 (11.4–19)	0.149[c]
GOLD			
2	98 (35.4%)	179 (64.6%)	< 0.001[c]
3	156 (30.1%)	363 (69.9%)	
4	27 (16.6%)	136 (83.4%)	

MEF – maximum expiratory flow-volume; FEV1 – forced expiratory volume in the first second; FVC – forced vital capacity
[a]t test;
[b]Pearson χ^2 test;
[c]Mann–Whitney U-test;
results are presented as count (%), mean ± SD or median (25–75th percentile)

Table 2. Electrocardiographic characteristics of chronic obstructive pulmonary disease patients in relation to the five-year mortality

Characteristics	Death in five years		p
	No	Yes	
Axis			
normogram	210 (31.4%)	458 (68.6%)	0.028[a]
left	71 (24.4%)	220 (75.6%)	
p > 2.5			
no	147 (28.2%)	375 (71.8%)	0.396[a]
yes	134 (30.7%)	303 (69.3%)	
RVH			
no	269 (28.8%)	664 (71.2%)	0.056[a]
yes	12 (46.2%)	14 (53.8%)	
RBBB			
no	184 (26.2%)	519 (73.8%)	< 0.001[a]
yes	97 (37.9%)	159 (62.1%)	
Incomplete RBBB			
no	225 (30.9%)	502 (69.1%)	0.047[a]
yes	56 (24.1%)	176 (75.9%)	
Low QRS			
no	120 (31.3%)	263 (68.7%)	0.260[a]
yes	161 (28%)	415 (72%)	
Transitional			
no	58 (27.6%)	152 (72.4%)	0.544[a]
yes	223 (29.8%)	526 (70.2%)	
LBBB			
no	270 (30.3%)	622 (69.7%)	0.016[a]
yes	11 (16.4%)	56 (83.6%)	
QRS < 0.12 s			
no	252 (28.9%)	621 (71.1%)	0.345[a]
yes	29 (33.7%)	57 (66.3%)	
S1S2S3			
no	276 (29%)	677 (71%)	0.010[b]
yes	5 (83.3%)	1 (16.7%)	
Negative T in V1/V3			
no	269 (29.1%)	655 (70.9%)	0.509[a]
yes	12 (34.3%)	23 (65.7%)	
QT < 400 ms			
no	2 (16.7%)	10 (83.3%)	0.525[b]
yes	279 (29.5%)	668 (70.5%)	

[a]Pearson χ^2 test;
[b]Fisher's exact test
LBBB – left bundle branch block; RBBB – right bundle branch block

28% of non-survivors and in 72% of survivors, transitional ECG zone was found in 29.8 % of non survivors and in 70.2% of surviving patients. LBBB was statistically higher in non-survivors. S1S2S3 configuration was statistically higher in non-survivors even in a small sample; V1–V3 leads negative T wave was found in 34.3% of the patients who died and in 65.7% survived patients; QRS duration ≤ 0.12 seconds was found in 33.7% of the non-survivors and in 66.3% of the surviving patients. QT < 0.12 was found in 29.5% of the patients who died and in 70.5% of the survived ones. ECG characteristics of COPD patients in relation to a five-year death outcome are presented in Table 2. Significant correlation with the five-year mortality is observed with normal axis, RVH, incomplete RBBB, LBBB, and S1S2S3. Patients with normal axis, incomplete RBBB, and LBBB had significantly higher percentage of mortality. In contrast, the patients with RVH and RBBB had significantly lower percentage of the five-year mortality. Only six patients had positive S1S2S3 and they will not be included in the multivariate model due to the small sample size for this analysis.

Logistic regression analysis is performed to assess significant predictors of mortality adjusted for potential confounders. Univariable and multivariable logistic regression analysis results are presented in Table 3. Only variables with p < 0.2 are presented in the univariate analysis.

Univariate analysis revealed that lung functions (FVC, FEV1, FEV1/FVC, GOLD) are significant predictors of mortality. Since all of them are highly multi-correlated, FEV1/FVC will was used for multivariate analysis as an adjusting variable for ECG parameters. RVH, RBBB, incomplete RBBB, LBBB, and S1S2S3 are also significantly correlated with the outcome. Since S1S2S3 is positive in only six patients, this variable was not used in multivariable modeling due to small sample size. The final model was performed using logistic regression backward method. Four steps were performed to obtain the final model, which was compared to the first model (all variables at the beginning) and the results of the Hosmer–Lemeshow goodness of fit test and Nagelkerke R^2 reveal similar characteristics of both models. We decided to use simple (final, backward model) as the model of five-year mortality predictors. The final model revealed two significant predictors of five-year mortality – RBBB and LBBB. Patients with LBBB had two times higher chance of mortality compared to patients without LBBB. In contrast, RBBB is a protective factor and patients with RBBB have 1.6 times lower chance of having death outcome.

DISCUSSION

COPD and cardiovascular diseases have common risk factors, including smoking and ageing. Also, both diseases are

Table 3. Regression model with exitus as outcome

Characteristics	Univariate		Multivariate (backward method)	
	OR (95% CI)	p	OR (95% CI)	p
FVC	0.988 (0.978–0.997)	0.007		
FEV1	0.978 (0.966–0.990)	< 0.001		
FEV1/FVC	0.949 (0.926–0.973)	< 0.001	0.951 (0.928–0.974)	< 0.001
MEF 25–75	1.005 (0.992–1.018)	0.436		
Gold	1.545 (1.247–1.916)	< 0.001		
Axis	1.421 (1.038–1.944)	0.028		
RVH	0.473 (0.216–1.035)	0.061		
RBBB	0.581 (0.429–0.787)	< 0.001	0.610 (0.448–0.830)	0.002
Incomplete RBBB	1.409 (1.003–1.978)	0.048		
LBBB	2.210 (1.140–4.284)	0.019	2.027 (1.039–3.956)	0.038
S1S2S3	0.082 (0.009–0.701)	0.022		

MEF – maximum expiratory flow-volume

presented with pro-inflammatory mechanisms and oxidative stress. Sedentary lifestyle in COPD may contribute to cardiovascular disease developing, as well [3, 4, 10]. A number of studies have reported ECG abnormalities and cardiac arrhythmias in COPD patients [5, 10]. The majority of ECG abnormalities are associated with COPD, which is mostly presented with a combination of two factors: pulmonary hypertension and anatomic changes. Pulmonary hypertension, however, is always the underlying pathologic mechanism for right ventricular hypertrophy in cor pulmonale and altered electrical conduction. Also, hyperinflation causes a thorax heart displacement position. Abnormalities in conduction usually occur late in COPD patients, after the right ventricle hypertrophy has developed to such an extent that its electrical forces overcome those of the left [11]. In our study, we have found no arrhythmias, despite the fact that almost half of the investigated groups had developed the COPD terminal stadium.

We included 835 cases with a stabile phase of COPD, evaluated by spirometry and electrocardiography. Some authors have reported higher age in men as a significant risk factor associated with FEV1 decline with age, so that the advanced disease stage tends to reduce the FEV1/FVC ratio [11, 12]. In our study, both sexes were of similar age, with more female participants, which is contrary to the fact that men suffer from COPD more frequently [11, 12, 13]. Some authors have investigated vertical QRS axis as a single criterion for a COPD disease screening in an adult hospital population, concluding that vertical QRS axis can detect COPD with 89% sensitivity and 96% specificity [10, 11]. In fact, vertical QRS axis is a synonym for COPD and its severity known as a "hanging heart" [10, 13]. It is explained by reduced Sokolow–Lyon index for left ventricular mass by obstruction and afterload, presumably reflections which both increased the right-sided and decreased the left-sided QRS amplitudes by the combined anatomical and electrical remodeling of the heart [12]. In COPD patients, hyperinflation of the lungs leads to the depression of the diaphragm, and this is associated with clockwise rotation of the heart along its longitudinal axis. This clockwise rotation means that the transitional zone (defined as the progression of rS to qR in the chest leads) shifts towards the left with the persistence of an rS pattern as far as V5 or even V6. This may give rise to a "pseudoinfarction" pattern, with deep S waves in the right precordial leads simulating the appearance of the QS waves and poor R wave progression seen in anterior myocardial infarction.

Other studies have shown the QRS right axis deviation dominance with clockwise rotation [10–13]. Unlike the study by Alter et al. [10] with the vertical QRS axis predominance, the normal axis is a more common finding in our study. In fact, it is a highly statistically important factor in patients who did not survive the five-year follow-up. Also, we had no patient with right axis on ECG. Our study has shown that vertical axis in COPD patients is not "the holy grail", always connected with COPD. The evaluation of ECG abnormalities' significance as COPD prognostic factors has started in 1975; it was reported by Kok-Jensen that an ECG p-II amplitude of at least 0.2 mV is related to poor prognosis [9]. Our study has shown that P wave ≥ 2.5 mm in height has no predicted value in mortality of COPD patients. In the present study, peaked P wave (amplitude > 2.5 mm) was recorded in 52.33% of the cases with COPD. In a Spodick's series, 13.9% of COPD patients had P-wave equal or greater than 2.5 mm [14]. Carid and Wilcken found incidence of P-pulmonale in 15.5% of their COPD patients, while another group of authors recorded the incidence of 32.7% in their respective studies [13, 14]. However, there was no statistical significance between survivors and non-survivors considering P wave height, which is not in concordance with previous studies [12, 13, 14].

Patients who had RVH recorded on ECG had lower five-year percentage of mortality. In our study, most participants belonged to GOLD stadium 3, which is characterized as severe. They had higher mortality percentage over the five-year period compared to GOLD 2 and 4 stadiums, despite the fact that patients in GOLD 4 stadium had very severe airway obstruction.

Other researchers have found variable COPD pulmonary hypertension and right ventricle remodeling prevalence, increased by disease progression, which is in concordance with our results [15, 16]. Although the exact prevalence is unknown, RVH appears to be a common complication of chronic lung disease, and more frequently complicates advanced lung disease [14, 16]. Generally, our study has shown earlier ECG COPD presentation as compared to previous studies, presented as early as GOLD 2 stadium, but mostly in GOLD 3 stadium. In COPD, chronic pulmonary hypertension accompanied by right ventricular work increase results in uniform RVH. Several mechanisms including pathophysiology of pulmonary hypertension could lead to COPD, chronic cor pulmonale, and consecutively to the right heart failure. In patients with COPD, P-pulmonale and the RVH ECG evidence are not shown unless FEV1 < 45% of predicted is presented (GOLD 2) [12, 13]. This led to the conclusion that RVH

develops faster than expected, which could be applicable to our study [12, 13, 16]. The appearance of complete and incomplete RBBB in otherwise healthy individuals is believed to be benign, but several cardiac and pulmonary diseases are known to be associated with RBBB and incomplete RBBB. In our study, they were more frequent in non-survivors and presented a mortality risk. Investigation of the pathophysiology of this pattern presents a challenge for future prospective studies**.** Investigators from Denmark have explored this issue in the Copenhagen City Heart Study prospective database with almost 19,000 subjects in the 1976–2003 period [17]. Patients with prior myocardial infarction, heart failure, or LBBB were excluded while 18,441 were included to be followed up until 2009. Primary end points were all-cause mortality, major cardiovascular events, and admission for COPD [17]. The original purpose of the study was to focus on prevention of coronary heart disease and stroke and to maximize the likelihood of identifying disease causes. Still, there are no explanations for a lot of questions [4, 16, 17, 18]. Thus, finding of incomplete or complete RBBB in COPD patients should not be neglected, and in these cases pulmonologists should order more cardiology examinations.

LBBB has been proposed as a risk factor for cardiovascular morbidity and mortality [16, 17]. LBBB in the absence of a clinically detectable heart disease is associated with new-onset heart failure and death from cardiovascular diseases. Further study is warranted to determine if additional diagnostic testing or earlier treatment in patients with asymptomatic LBBB can decrease cardiovascular morbidity or mortality [19]. Our study had shown that LBBB is a predictor of mortality in COPD patients. There are no facts to suggest a connection between the two. Possible explanations are age, smoking, hypoxemia atherosclerosis, diabetes.

It is common that patients with COPD show low ORS complex (LQRSV), particularly in the limb leads, because of an increased heart/chest wall distance from the lung hyperinflation, which, if not offset, would be expected to augment QRS potentials by the increased electrical impedance [6, 15, 16]. The amplitude of the QRS complexes may be small in patients with COPD as lung hyperinflation leads to poor electrical conductors. Our study registered low ORS voltage in 69% of the patients, but this had no influence of the outcome in COPD patients.

T wave may be inverted in leads V1, V2, or V3 due to RVH, commonly found due to varying effect of lung hyperinflation, axis deviation, and enlargement of the right ventricle. Generalized ST depression with T wave inversion may also be seen [17, 18]. In our study, negative T wave had no predictive value in COPD mortality.

The point of our study is to find out which ECG pattern could be a predictive model for five-year mortality in COPD patients. We used logistic regression analysis to assess significant predictors of mortality adjusted for potential confounders. Final model discovered two significant predictors – RBBB and LBBB. In fact, patients with LBBB registered on ECG have two times higher chance of mortality compared to patients without LBBB. This finding is not surprising considering that LBBB in not a finding that should not be easily dismissed in any patient or disease. In contrast, RBBB is a protective factor and patients with RBBB have 1.6 times lower chance of fatal outcome. To date, RBBB is not considered a dangerous condition and many people have it unknowingly, without any symptoms, and its discovery is usually incidental [17, 18]. 'Silent' RBBB in COPD patient is a very frequent finding. The exact explanation for this does not exist, but further studies could elucidate electrical activity of the heart in COPD patients [19, 20].

The ECG findings were found to be 35.7% sensitive and 95.6% specific in the diagnosis of COPD among patients with respiratory problems. Hence, there is a chance of false negative but not of false positive findings in detecting COPD cases by ECG. Based on the findings of the study, positive predictive value was found to be 71.4%, meaning thereby that the chances of COPD are high among patients having ECG changes. Similarly, negative predictive value was 83%, meaning thereby that the chances of not having COPD among patients not having ECG changes are also quite high [6, 16, 17, 20, 21].

Improving survival of COPD patients has been the central theme for years. Most of the conducted studies put the focus on therapy and rehabilitation, giving no attention to ECG screening. According to our study, ECG screening in COPD patients should be obligatory, followed-up with regular ECG monitoring, especially if the normal axis, incomplete RBBB, and LBBB were found. Those patients should be monitored more frequently by both the pulmonologist and the cardiologist.

CONCLUSION

COPD patients with normal axis, incomplete RBBB, and LBBB have significantly higher percentage of five-year mortality. Apart from that, patients with LBBB have two times higher chance of mortality than those without it. On the other hand, patients with RBBB have lower risk of mortality and according to our study this pattern is a possible protective characteristic in COPD patient. Main ECG predictors of COPD patients' five-year mortality are LBBB and RBBB, but according to the statistical model, ECG should be further explored and possibly obligatory in the routine clinical practice as an easy and low-cost screening method. It is extremely important to emphasize that patients who have both cardiovascular and pulmonary disease are at a higher risk of mortality and that both diseases should be treated in parallel and independently as recommended by the GOLD guidelines.

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Електрокардиографски предиктори петогодишњег морталитета оболелих од хроничне опструктивне болести плућа

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САЖЕТАК

Увод/Циљ Најчешћи коморбидитети међу оболелим од хроничне опструктивне болести плућа (ХОБП) су обољења кардиоваскуларног система.

Циљ ове студије је процена параметара електрокардиографије (ЕКГ) и предиктора смртности код болесника са ХОБП-ом.

Методе У студију је укључено укупно 835 болесника. Болесници су класификовани да болују од ХОПБ-а ако је у три узастопна мерења постбронходилататорна вредност *FEV*1/*FVC* била < 70%. Праћене су следеће промене у ЕКГ-у: осовина, П-талас, комплекс с ниским *ORS*-ом, прелазна зона, блок леве гране Хисовог снопа (*LBBB*), блок десне гране (*RBBB*), непотпуни блок десне гране снопа, конфигурација *S1S2S3*, негативан *T* у *V*1–*V*3. Праћен је морталитет оболелих у периоду од пет година.

Резултати И преживели и преминули били су сличног узраста, пола и статуса ХОПБ-а. *FVC* и *FEV*1, као и *GOLD* стадијум, значајно су већи у групи која је преживела ($p < 0,016$, $p < 0,001$, $p < 0,001$, респективно). Нормална осовина била је у знатно већем проценту код умрлих болесника ($p = 0,020$). Десни *RBBB* и непотпуни *RBBB* су чешћи налаз код болесника који су умрли ($p < 0,001$, $p < 0,05$, респективно). Конфигурација *LBBB*, *S1S2S3* је у знатно вишем проценту код умрлих болесника ($p < 0,016$, $p < 0,001$, респективно). У мултиваријабилном логистичком моделу болесници са *LBBB* имају двоструко већу шансу за смртност у поређењу са болесницима без *LBBB*. Супротно, болесници са *RBBB* имају 1,6 пута мању шансу да изгубе живот.

Закључак Главни ЕКГ предиктори петогодишњег морталитета код ХОПБ-а су *LBBB* и *RBBB*, али према статистичком моделу, електрокардиограм треба додатно истражити и евентуално обавезно укључити у рутинску клиничку праксу као једноставан и приступачан метод скрининга.

Кључне речи: хронична опструктивна болест плућа; електрокардиограм; морталитет