Original Research Paper

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A STUDY ON ECG CHANGES IN COPD PATIENTS

Medicine

KEYWORDS: COPD, ECG, Right axis deviation, RBBB

Dr. Santanu Kumar Ghosh — Assistant Proffessor, Deptt. Of Chest Medicine, Jawahar Lal Nehru Medical College, Bhagalpur.

Dr. Hem Shanker Sharma — Assistant Proffessor, Deptt. Of Chest Medicine, Jawahar Lal Nehru Medical College, Bhagalpur.

ABSTRACT

Chronic obstructive pulmonary disease (COPD) is a major cause of morbidity and mortality across the globe. According to World Health Organization estimates, 65 million people have moderate to severe COPD. More than 3 million people died of COPD in 2005 corresponding to 5% of all deaths globally and it is estimated to be the third leading cause of death by 2030. Smoking is by far recognized to be the most important risk factor for development of COPD. Apart from its respiratory morbidity and mortality, its cardiovascular effects are concerning. Timely diagnosis of COPD and early recognition of any cardiovascular complications of COPD is the key to success. In our study we will demonstrate the various ECG changes in COPD patients and their relationship with severity of the disease.

INTRODUCTION:

Chronic obstructive pulmonary disease (COPD) is a type of obstructive lung disease characterized by long-term poor airflow. The main symptoms include dyspnoea and cough with sputum production. COPD typically worsens over time. Tobacco smoking is the most common cause of COPD, with a number of other factors such as air pollution and genetics playing a smaller role. In the developing world, one of the common sources of air pollution is poorly vented heating and cooking fires. Long-term exposure to these irritants causes an inflammatory response in the lungs resulting in narrowing of the small airways and breakdown of lung tissue. The diagnosis is based on poor airflow as measured by pulmonary function tests. However, COPD patients are not routinely evaluated in developing countries like India foe ECG changes. Therefore in our study we will deal with the ECG changes in a COPD patient.

AIMS AND OBJECTIVES:

1. To find out various ECG abnormalities in COPD patients
2. To find out association of ECG changes according to the severity of disease.

MATERIALS AND METHODS:

The study was conducted in the Chest department and Medicine department of JLN Medical college, Bhagalpur.

SAMPLE SIZE: 100 patients of COPD were enrolled in the study after informed consent

INCLUSION CRITERIA:

1. All patients must be >18 yearss old
2. Patients should be proven cases of COPD

EXCLUSION CRITERIA:

Patients with bronchial asthma, TB or post TB fibrosis, bronchiectasis, interstitial lung disease, primary pulmonary hypertension or any cardiac disease were excluded from the study.

After gaining informed consent from each patients we took a proper history with particular emphasis on duration of cough, amount of sputum, breathlessness, TB and smoking history. We examined each case physically.

We subjected the patients to various laboratory tests like CBC, Sputum for AFB, Chest X-Ray, Pulmonary function tests(PFT) and ECG. The severity of COPD patients were evaluated by PFT using the GOLD criteria.

All collected data were analysed by proper statistical methods.

RESULTS:

AGE	NO. OF CASES	PERCENTAGE(%)
40-49	4	4
50-59	26	26
60-69	55	55
70-79	15	15
TOTAL	100	100

Table 1. AGE distribution of COPD patients in the study.

ECG FINDING	No OF CASES	PERCENTAGE(%)
RIGHT AXIS DEVIATION	45	45
P PULMONALE	35	35
POOR PROGRESSION OF R WAVE	27	27
LOW VOLTAGE COMPLEX	26	26
RBBB	12	12
RIGHT VENT. HYPERTOPHY	13	13

Table2. Interpretation of ECG findings in our study

According to our study most common ECG finding was Right axis deviation which was present in 45% of cases. P Pulmonale was present in 35% of cases while poor progression of R wave was seen in 27% of cases. Low voltage complex, RBBB and Right ventricular hypertrophy was found in 26%, 12% and 13% of cases respectively.

ECG FINDING	MILD COPD (n=23)	MODERATE COPD (n=40)	SEVERE(n=25)	VERY SEVERE(n=12)
RAD	5	12	20	8
P PULMONALE	2	10	20	3
POOR PROGRESSION OF R WAVE	0	9	12	6
LOW VOLTAGE COMPLEX	6	11	05	4
RBBB	0	3	08	1
RIGHT VENT. HYPERTROPHY	0	2	09	2

Table 3.ECG findings in study population according to severity of COPD
(NB: A patients can have multiple ECG findings)

Here in this table we see that RAD and Low voltage complex were common findings in Mild COPD, while RAD,P Pulmonale, low voltage complex, poor progression of R wave are commoner in Moderate COPD. In severe and very severe COPD we see that all the ECG abnormalities were present, RBBB and RVH being less common.

DISCUSSION:

Chronic obstructive pulmonary disease (COPD) is a chronic inflammatory lung disease that causes obstructed airflow from the lungs. Symptoms include breathing difficulty, cough, mucus

(sputum) production and wheezing. It's caused by long-term exposure to irritating gases or particulate matter, most often from cigarette smoke. People with COPD are at increased risk of developing heart disease, lung cancer and a variety of other conditions. Emphysema and chronic bronchitis are the two most common conditions that contribute to COPD. Chronic bronchitis is inflammation of the lining of the bronchial tubes, which carry air to and from the air sacs (alveoli) of the lungs. It's characterized by daily cough and mucus production. Emphysema is a condition in which the alveoli at the end of the smallest air passages (bronchioles) of the lungs are destroyed as a result of damaging exposure to cigarette smoke and other irritating gases and particulate matter.

COPD symptoms often don't appear until significant lung damage has occurred, and they usually worsen over time, particularly if smoking exposure continues. For chronic bronchitis, the main symptom is a daily cough and mucus (sputum) production at least three months a year for two consecutive years.

The sensitivity of physical examination in detecting mild to moderate COPD is relatively poor, but physical signs are quite specific and sensitive for severe disease. Findings in severe disease include the following:

- Tachypnea and respiratory distress with simple activities
- Use of accessory respiratory muscles and paradoxical indrawing of lower intercostal spaces (Hoover sign)
- Cyanosis
- Elevated jugular venous pulse (JVP)
- Peripheral edema

Thoracic examination reveals the following:

- Hyperinflation (barrel chest)
- Wheezing – Frequently heard on forced and unforced expiration
- Diffusely decreased breath sounds
- Hyperresonance on percussion
- Prolonged expiration
- Coarse crackles beginning with inspiration in some cases

The formal diagnosis of COPD is made with spirometry; when the ratio of forced expiratory volume in 1 second over forced vital capacity (FEV1/FVC) is less than 70% of that predicted for a matched control, it is diagnostic for a significant obstructive defect. Criteria for assessing the severity of airflow obstruction (based on the percent predicted postbronchodilator FEV1) are as follows:

- Stage I (mild): FEV 1 80% or greater of predicted
- Stage II (moderate): FEV 1 50-79% of predicted
- Stage III (severe): FEV 1 30-49% of predicted
- Stage IV (very severe): FEV 1 less than 30% of predicted or FEV 1 less than 50% and chronic respiratory failure.

This is also known as GOLD criteria.

A Chest X ray and CBC may be useful to exclude other conditions at the time of diagnosis. Characteristic signs on X-ray are over expanded lungs, a flattened diaphragm, increased retrosternal airspace, and bullae while it can help exclude other lung diseases, such as pneumonia, pulmonary oedema or a pneumothorax A high-resolution CT scan of the chest may show the distribution of emphysema throughout the lungs and can also be useful to exclude other lung diseases. An ABG is used to determine the need for oxygen; this is recommended in those with an FEV1 less than 35% predicted, those with a peripheral oxygen saturation of less than 92% and those with symptoms of congestive heart failure. In areas of the world where alpha-1 antitrypsin deficiency is common, people with COPD (particularly those below the age of 45 and with emphysema affecting the lower parts of the lungs) should be considered for testing.

ECG changes in COPD are because of several factors:

1. The presence of hyperexpanded emphysematous lungs within the chest
2. The long-term effects of hypoxic pulmonary vasoconstriction upon the right side of the heart, causing pulmonary hypertension and subsequent right atrial and right ventricular hypertrophy (i.e. cor pulmonale)
3. Lung hyperexpansion causes external compression of the heart and lowering of the diaphragms, with consequent elongation and vertical orientation of the heart
4. Due to its fixed attachments to the great vessels, the heart undergoes clockwise rotation in the transverse plane, with movement of the right ventricle anteriorly and displacement of the left ventricle posteriorly
5. The presence of increased air between the heart and recording electrodes has a dampening effect, leading to reduced amplitude of the QRS complexes
6. Chronic hypoxaemia causes reflex vasoconstriction in the pulmonary arterioles ("hypoxic pulmonary vasoconstriction"), with consequent elevation of pulmonary arterial pressures
7. Over time, this chronic elevation of pulmonary arterial pressures results in compensatory right atrial and right ventricular hypertrophy

Thus we can say that development of ECG findings demonstrate that the COPD is progressive and is of higher grade.

SUMMARY:

COPD usually gets gradually worse over time and can ultimately result in death. It is estimated that 3% of all disability is related to COPD. The proportion of disability from COPD globally has decreased from 1990 to 2010 due to improved indoor air quality primarily in Asia. The overall number of years lived with disability from COPD, however, has increased. The development of ECG abnormalities in patients with COPD indicates that the disease is progressing or of a higher grade. In our study we have found that the prevalence of Right axis deviation is found in about 45% of cases and P Pulmonale in about 35% of cases. We can see that as the COPD progresses from a lower grade to higher grade more and more ECG abnormalities arise. Thus proper diagnosis, smoking cessation and treatment of COPD is essential for the prevention of occurance of cardiovascular diseases.

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