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Research Paper

A Study of Ecg Manifestations in 100 Cases of Pulmonary Hypertension

Management

KEYWORDS : ECG, PAH, Pulmonary hypertension, RVSP

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ABSTRACT

Background & Objectives: *The present study has been undertaken to study the ECG changes in pulmonary hypertension due to various causes and to find their importance in predicting the further complications to follow.*

Methods: *This is a prospective observational study done at Department of Pulmonary Medicine, B.J. Medical College & Civil Hospital, Ahmedabad on random 100 adult patients aged >12 years of both sexes who came to outpatient department or admitted, diagnosed for Pulmonary Hypertension and willing to participate in the study. The study was done over period of 2 years from 2012 to 2014.*

Results: *Most of the patients were male. Mean age of the patients was 48.13 years & Male to female ratio was 1.12:1. Most common symptom was breathlessness which was present in 88% of patients. Most of patients had secondary type of Pulmonary Hypertension. Out of 97 patients who had secondary Pulmonary Hypertension had some kind of underlying lung disorder. Most of them had mild pulmonary hypertension. 82 patients had tachycardia and 1 patient had bradycardia. 77 patients had right axis deviation of QRS complex and 23 patients had no deviation of QRS complex axis. 64 patients had P wave amplitude of more than 2.5 mm. 58 patients had right axis deviation of P wave and 42 patients had no deviation of P wave axis. 11 patients had completely normal ECG.*

Conclusions: *It is being increasingly recognized that to avoid advancing cardiac involvement in respiratory diseases the ECG abnormalities signalling involvement of right ventricular functions are of great importance in follow up of such patients and gives an early warning to rising pulmonary hypertension. Thus the patient can be put on adequate management to avoid further deterioration at an early stage and this significantly alters the prognosis of the patients.*

INTRODUCTION

Heart and lung forms a single functional unit, was first realized by Laennec[1,2] in 1826, when he observed that advanced lung diseases can cause heart failure even in people with healthy heart. After the discovery of the Electrocardiography (ECG) many workers studied the changes seen in the ECG in various diseases of heart, because ECG proved to be the most convenient non-traumatic and non-invasive bedside investigational aid. Two–thirds of patients with chronic bronchitis had evidence of right ventricular hypertrophy demonstrated by increased weight of the right ventricle[3].

It is being increasingly recognized that to avoid advancing cardiac involvement in respiratory diseases the ECG abnormalities signalling involvement of right ventricular functions are of great importance in follow up of such patients and gives an early warning to rising pulmonary hypertension. Thus the patient can be put on adequate management to avoid further deterioration at an early stage and this significantly alters the prognosis of the patients.

The present study has been undertaken to study the ECG changes in pulmonary hypertension due to various causes and to find their importance in predicting the further complications to follow. Aims for the study were following.

1. To find out the types of ECG changes in Pulmonary Hypertension
2. To correlate ECG changes in secondary Pulmonary Hypertension with various lung disease
3. To find out incidence of primary and secondary Pulmonary Hypertension
4. To find out the percentage of abnormal ECG in patients of Pulmonary Hypertension

MATERIALS AND METHODS

This is a prospective observational study done at Department of Pulmonary Medicine, B.J. Medical College & Civil Hospital, Ahmedabad on random 100 adult patients aged >12 years of both sexes who came to outpatient department or admitted, diagnosed for Pulmonary Hypertension and willing to participate in the study. The study was done over period of 2 years from 2012 to 2014. All patients suspected for pulmonary hypertension were gone under Two Dimensional Echocardiography (2DEcho) for measurement of Right Ventricular Systolic Pressure (RVSP) and diagnosed to be having pulmonary hypertension according to value of RVSP[4].

Mild – 35-44 mmHg

Moderate – 45-59 mmHg

Severe – ≥60 mm Hg

All those patients were then gone through various investigations like complete blood count, liver & renal function testing, Chest X-ray, Electrocardiography, Computerised tomography (CT) of thorax, Computerised tomographic pulmonary angiography (CTPA), Ultrasonography (USG) of thorax, Bronchoscopy and Right Heart Catheterization as per requirement and diagnosed the underlying cause for the pulmonary hypertension and managed accordingly.

RESULTS

Table – 1 shows that out of total 100 patients 53 were males and 47 were females. In males, most of them were of more than 60 years of age and in females, most of them were around 45 years of age. Mean age of the patients was 48.13 years & Male to female ratio was 1.12 : 1.

Most common symptom was breathlessness which was present in 88% of patients followed by coughing with expectoration (65%), edema (52%), fever (38%), chest pain (33%), palpitation (31%), giddiness (24%), dry coughing (21%) and oliguria (11%).

Most of patients had secondary type of Pulmonary Hypertension which was about 97%. Rest 3% patients had primary Pulmonary Hypertension.

Table – 2 shows that out of 97 patients who had secondary Pulmonary Hypertension had some kind of underlying lung disorder. Some of them also had more than one disorder. The most common underlying lung disorder is Extensive Pulmonary Tuberculosis (PTB) (38%) followed by Chronic Obstructive Pulmonary Disease (COPD) (33%), Fibro-cavitory Lung Disease (FCLD) (22%), Bronchiectasis (BRE) (16%), Interstitial Lung Disease

(ILD) (5%), Obstructive Sleep Apnea (OSA) (2%) and Pulmonary Thrombo-embolism (PTE) (1%). In male patients, the prevalence of COPD (30%) causing pulmonary hypertension should not be neglected.

Out of 100 patients most of them had mild pulmonary hypertension which was about 38%. Percentage of moderate and severe PAH was 28% and 34% respectively. They were almost evenly distributed among males and females.

82 patients had tachycardia (heart rate more than 100/min) and 1 patient had bradycardia (heart rate less than 60/min). 17 patients had normal heart rate. 77 patients had right axis deviation of QRS complex and 23 patients had no deviation of QRS complex axis. No patients had left deviation of QRS complex axis. 64 patients had P wave amplitude of more than 2.5 mm means "P Pulmonale". Rest 36 patients had normal amplitude of P wave. 58 patients had right axis deviation of P wave and 42 patients had no deviation of P wave axis. No patients had left deviation of P wave axis.

11 patients had completely normal ECG. In other ECG abnormalities, Right Bundle Branch Block (RBBB) was present in 3 patients, Ventricular Premature Contraction (VPC) in 7 patients, ST segment depression in 6 patients and T wave inversion in 2 patients.

DISCUSSION

Table-3 shows that in majority of previous studies females were more involved in the pulmonary hypertension. But in the present study female to male ratio was 0.8:1. In present study mean age of patients was 48.13 years which is comparable with the previous study done by Eduardo Bossone et al[5] in which it was 41.7 years. In one another study by Geoff Strange et al[6] it was 75 years. The difference in the mean age between the studies can be due to small study group of the present study and difference in the demographic trends of the population.

Table – 4 shows that in the present study most common symptom in patients was breathlessness which was present in 88% of patients. It is comparable with previous study by Mc Goon et al [7] and Richa S. et al [8] in which also most common symptom was breathlessness and present in about 60% patients. The frequency of other symptoms is also comparable. The difference in the frequency of other symptoms between the studies can be due to small study group of the present study and the duration between patient come to hospital and he had disease was more in present study due to illiteracy in study population.

In present study majority of patients had underlying one or another respiratory causes for pulmonary hypertension. 97% patients in present study had secondary pulmonary hypertension as compared to previous Report of the American College of Cardiology Foundation Task Force [9] in which incidence of secondary pulmonary hypertension was 53% and primary PAH was 47%. As we have conducted the present study in lung institute, so majority of patients included in study had some lung disease and having secondary pulmonary hypertension.

In present study most patients had mild pulmonary hypertension (38%), which is comparable with previous study by Jayme Rock Willoughby et al [4] in which it is also 33.33%.

In present study 82% patients had tachycardia, 17% patients had normal heart rate and only 1% patients had bradycardia which comparable with previous study by Catalyd et al [10] in which 58% patients had tachycardia, 39% patients had normal heart rate and 3% patients had bradycardia. The patient with bradycardia in present study had severe hypertension and on beta blocker drugs for long period so it may be the cause for the same.

In present study 77% patients had Right Axis Deviation of QRS complex which is comparable with previous studies by P.wood et al[11] (76%), Sanghavi & Kotia et al[12] (52%), Spodick et al[13] (73%), Padmavati et al[14] (78%), Mishra et al[15] (63%) and Bhalla J. S. et al[16] (70%).

In present study 64% patients had P wave amplitude in ECG more than 2.5mm which is comparable with majority of previous studies by Spodick et al[13] (14%), Chappel et al[17] (29%), Catalyd et al[10] (56%), Padmavati Raizada et al[14] (95%) and Tandon et al[18] (50%).

In present study 58% patients had Right Axis Deviation of P wave which is comparable with previous studies by Caird & wikkan et al[19] (79%), Spodick et al[13] (73%), Chappel et al[17] (91%), Catalyd et al[10] (56%), Tandon et al[18] (75%) and Bhalla J. S. et al[16] (80%).

In present study 3% patients had RBBB which is comparable with previous studies by Wasserderger et al [20] (2.6%), Caired et al [19] (3.4%), Spodick et al [13] (15.6%), Chappel et al[17](8.1%), Bhargava woolf et al [21] (5%), Pathak K.J. et al [22] (9%). In present study 7% patients had T Inversion and 6% patients had ST Depression. In one study by Eduardo Bossone et al [5] this changes were 68% and 24% respectively. As that study by Eduardo Bossone et al [5] was conducted in cardiology institute ST-T changes were more prevalent in that study comparing to present study which was carried out in lung institute. In present study 11% patients had Normal ECG which is comparable with previous study by Gregory S. Ahearm et al [23] which was 13%.

From this study we can conclude that Pulmonary Hypertension mostly occurs among the 4th and 5th decade of life. Most of the patients present with symptoms like breathlessness, coughing and pedal edema and other sighs of right ventricular failure like ascities, polyuria, fatigue, palpitations, raised JVP, loud second heart sound specifically P_2 component and hepatomegaly etc. Among secondary Pulmonary Hypertension patients, common underlying lung diseases are COPD, PTB or its sequel. Majority of the Pulmonary Hypertension patients have some kind of ECG features from which we can suspect the disease early. Patients with suspected Pulmonary Hypertension and ECG changes of Pulmonary Hypertension should be undergo 2DEcho atleast. Minority of patient with Pulmonary Hypertension have normal ECG, so if we are suspecting strongly we should go for 2DEcho, CTPA or Right Heart Catheterisation in those patients. ECG is the cheap, non invasive and easily available tool for suspecting Pulmonary Hypertension.

TABLES

Table - 1

Distribution of Patients According To Age And Sex

Age in years	Male	Female	Total
20-29	6	8	14
30-39	4	6	10
40-49	12	14	26
50-59	11	11	22
≥ 60	20	8	28
Total	53	47	100

Table – 2

Distribution Of Patients According To Associated Condition In Secondary Pulmonary Hypertension

PTB – Pulmonary Tuberculosis, COPD – Chronic Obstructive Pulmonary Disease, FCLD – Fibrocavitory Lung Disease, BRE –

Bronchiectasis, ILD – Interstitial Lung Disease, OSA – Obstructive Sleep Apnea, PTE – Pulmonary Thrombo Embolism

Age Group in years	No. of patients												Grand Total
	20-29		30-39		40-49		50-59		≥ 60		Total		
Associated Condition	M	F	M	F	M	F	M	F	M	F	M	F	
Extensive PTB	4	7	1	3	4	6	3	3	4	3	16	22	38
COPD	-	-	1	-	4	1	10	-	15	2	30	3	33
FCLD	-	4	-	1	2	3	3	6	3		8	14	22
BRE	-	-	3	1	3	2	1	3	2	1	9	7	16
ILD	-	-	-	1	-	1	-	1	1	1	1	4	5
OSA	-	-	-	-	-	-	-	1	-	1	-	2	2
PTE	1	-	-	-	-	-	-	-	-		1	-	1

Table – 3
Comparison of Sex Ratio and Mean age of Pulmonary Hypertension

Study	Female to Male Ratio	Mean Age in years
Geoff Strange et al	1.5 : 1	75.00
Eduardo Bossone et al	7.3 : 1	41.70
Present Study	0.8 : 1	48.13

Table – 4
Comparison of Symptoms of Pulmonary Hypertension

Symptoms	Mc Goon et al	Richa S. et al	Present Study
Dry coughing		14 %	21 %
Coughing with expectoration			65 %
Breathlessness	60 %	60 %	88 %
Chest pain	7 %		33 %
Fever			38 %
Palpitation	5 %		31 %
Edema	3 %	19 %	52 %
Oliguria			11 %
Giddiness	13 %	22 %	24 %

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