STUDY TO EVALUATE ASSOCIATION OF RIGHT VENTRICULAR DYSFUNCTION WITH PORTAL HYPERTENSION.

INTRODUCTION:

Pulmonary hypertension (PAH) is the most common cause of right heart failure and right ventricular dysfunction (RVD). Pulmonary hypertension (PH) is a form of pulmonary arterial hypertension (PAH) associated with portal hypertension with or without underlying chronic liver disease leading to right ventricular dysfunction. The aim of this study is to evaluate prevalence of right ventricular dysfunction and its association with portal hypertension, body mass index (BMI), systemic hypertension and smoking. In the French Registry for pulmonary hypertension, patients with portal hypertension were sign and symptoms like ascites, malena, hematemesis, splenomegaly, icterus, caput medusa, cachexia. Portal hypertension was confirmed by ultrasound abdomen with features of dilated portal vein >13 mm, portal vein velocity <15 cm/sec, loss of respiratory variation i.e. biphasic flow in portal vein, splenomegaly, ascites and supporting features liver cirrhosis, thrombosis of portal or hepatic vein. Patient suffering from connective tissue disease, congenital heart disease, left ventricle systolic dysfunction, valvular heart disease, lung disease, sleep related disorder breathing, chronic hemolytic and myeloproliferative disorder, HIV, family history of pulmonary hypertension and with history of intake of anorexic drug were excluded from this study. Those screened positive of portal hypertension underwent trans-thoracic echocardiography for calculation of PASP (pulmonary artery systolic pressure) as described in table-1, below and for right ventricular dysfunction using TAPSE(tricuspid annulus plane systolic excursion) and TDI( tissue doppler imaging) S’ was calculated (table-2).

<table>
<thead>
<tr>
<th>Table 1. Staging severity of pulmonary hypertension.</th>
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<tbody>
<tr>
<td>PAH(pulmonary artery hypertension)</td>
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<tr>
<td>-----------------------------------</td>
</tr>
<tr>
<td>Mild</td>
</tr>
<tr>
<td>Moderate</td>
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<tr>
<td>Severe</td>
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<table>
<thead>
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<th>Table 2. Right ventricular dysfunction</th>
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<tbody>
<tr>
<td>TAPSE(tricuspid annulus plane systolic excursion)</td>
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<td>TDI( tissue doppler imaging) S’</td>
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</table>

HRCT was done in those screened positive for pulmonary artery hypertension(PAH) in echocardiography to rule out lungs disease as a secondary cause of PAH.
Blood pressure was measured frequently during hospital stay and hypertension was defined as systolic blood pressure ≥140 mmHg or diastolic blood pressure ≥90 mmHg; or use of antihypertensive medications. Body mass index (BMI) was calculated by body weight (kg)/height (m2). Smokers were defined by self-report of cigarette smoking during the year prior to study.

SPSS version-20, used for statistical analysis. For categorical variables; Pearson Chi-square was used. Quantitative mean with standard deviation was used.

**Observation:**

Table-3. Result summarized below.

<table>
<thead>
<tr>
<th>variables</th>
<th>RVD present (n=12)</th>
<th>RVD absent (n=72)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>age</td>
<td>53.33 ± 8.3 year</td>
<td>51.58 ± 9.4</td>
<td>0.86</td>
</tr>
<tr>
<td>male</td>
<td>10(75.6%)</td>
<td>54(84.4%)</td>
<td>0.74</td>
</tr>
<tr>
<td>female</td>
<td>2(20%)</td>
<td>18(80.%)</td>
<td>0.74</td>
</tr>
<tr>
<td>Systemic hypertension</td>
<td>2(40%)</td>
<td>3(60%)</td>
<td>0.008</td>
</tr>
<tr>
<td>Smoking</td>
<td>2(8%)</td>
<td>23(92%)</td>
<td>0.971</td>
</tr>
<tr>
<td>Pulmonary hypertension</td>
<td>10(83.3%)</td>
<td>2(16.7%)</td>
<td>0.0001</td>
</tr>
<tr>
<td>BMI(kg/m²) Normal</td>
<td>18.5 to 24.99</td>
<td>3(25.9%)</td>
<td>101</td>
</tr>
<tr>
<td>BMI(kg/m²) Overweight</td>
<td>25.0 to 30.00</td>
<td>8(22.2%)</td>
<td>28</td>
</tr>
<tr>
<td>BMI(kg/m²) Obese &gt;30</td>
<td>30.1 to 40.00</td>
<td>1(14.28%)</td>
<td>6</td>
</tr>
</tbody>
</table>

(RVD- right ventricular dysfunction)

Overall prevalence of right ventricular dysfunction(RVD) was was 14.28%[12], in male it was 15.6% and female it was 20.0%. Sex was insignificant in RVD with p-value of 0.74. Mean age of RVD patients were 53.33 ± 8.3 year, age was insignificant with p-value 0.86.

Patients with normal BMI range group were less commonly affected with RVD with prevalence of 2.9%. Overweight and obese group were more commonly affected with prevalence of 22.2% and 14.3% respectively. BMI was found significant in RVD patients with p-value of 0.01.

Hypertension prevalence in RVD patients was 40% as compared to 60% in non-portopulmonary hypertensive patients. Hypertension is significant with p-value of 0.008.

Smoking prevalence in RVD patients were 8% as compared to 92% in non- in non-portopulmonary hypertensive patients with P-value of 0.971.

Right ventricular dysfunction(RVD) prevalence in pulmonary hypertension and non- pulmonary hypertension group were 83.3% and 16.7% respectively with p-value of 0.0001.

**Discussion:** In this study overall prevalence of right ventricular dysfunction is 14.28%.

Study by John J Ryan et al. in 2015 said that that increased understanding of adrenergic, angiogenic, fibrotic and metabolic derangements in the RV in PAH will offer new therapeutic targets to enhance RV function.[12]

The prevalence of portopulmonary hypertension in patients undergoing liver transplant (LT) is considered to be higher, with one study by Hadengue A et al. showing a prevalence of 8.5%.[13]

Study by Ramsay M et al. in 2010 concluded that in patients with portal hypertension a pathological state exists in which changes in the pulmonary vasculature cause an increase in pulmonary vascular resistance[4]. The resultant increased work of the right ventricle may cause right heart failure and liver congestion.

Pulmonary arterial hypertension (PAH) is a right heart failure syndrome. In early-stage PAH, the right ventricle tends to remain adapted to afterload with increased contractility and little or no increase in right heart chamber dimensions. In more advanced stages, RV systolic function cannot remain matched to afterload and dilatation of the right heart chamber progressively develops.

The fraction of patients with portopulmonary hypertension in the National Institutes of Health (NIH) registry was 8%, and it can be seen in up to 10% of patients evaluated for liver transplantation.[15]

Study by Plevak D and Benjmovin FS et al. patients who have advanced liver disease, especially those assessed or referred for liver transplantation, pulmonary hypertension leading to right ventricular dysfunction occurs in up to 16%.[16,17]

Prevalence of right ventricular dysfunction in male and female is 15.6% and 20.0% respectively. Sex was insignificant in PPH with p-value of 0.974. Female sex is more affected in pulmonary hypertension so the right ventricular dysfunction.

BMI was found statistically significant in right ventricular dysfunction patients with p-value of 0.01.

A retrospective single center study by Scott E. Friedman and Bruce W. Andrews et al. in 2012 reported 5% of otherwise healthy individuals with a BMI > 30 kg/m² had moderate or severe pulmonary hypertension (PASP greater than 50 mm Hg on echocardiogram). [18]

REVEAL registry, the largest pulmonary hypertension database in the United States, indicate a higher prevalence of overweight and obese individuals among those with idiopathic forms of PAH and right ventricular dysfunction.[19]

Hypertension was significant in right ventricular dysfunction with p-value of 0.008.

Analysis of REVEAL registry by Bersohn MM et al. in 2013 concluded increased systolic blood pressure and heart rate as high-risk group.[20]

Studies by Schies R et al. in 2010 concluded that tobacco smoking was significantly more common in PAH and tobacco smoke exposure may be a risk factor for men with pulmonary hypertension and right ventricular dysfunction,[21], but in our study smoking was statistically insignificant with p-value of 0.971.

Pulmonary artery hypertension was strongly associated with right ventricular dysfunction with p-value of 0.0001.

**Conclusion:** This study points towards increasing trends of prevalence of right ventricular dysfunction associated with pulmonary hypertension in portal hypertensive patients. As severe pulmonary hypertension associated with portal hypertension is a contraindication to liver transplantation, early diagnosis and treatment may help patients in liver transplantation.

**REFERENCES**

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