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Original Research Article

Comparative study of CA-125 and 2D echo for detection of right ventricular failure in COPD patients

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ABSTRACT

Background: COPD is characterized by persistent airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the airways and the lung to noxious particles or gases. It leads to cor pulmonale causing right ventricular failure. Present study compares the serum level of CA-125 and 2 D Echo for detection of right ventricular failure in COPD patients.
Methods: In this study 178 patients suffering from COPD has been taken after following inclusion and exclusion criteria and informed consent. Serum CA 125 levels are evaluated in all patients and compared with the right ventricular functions.
Results: The mean CA125 was higher in subjects with RV failure (96.32) as compared to those subjects with RV normal (37.17). The result was statistically significant. ($p<0.001$). The mean duration of illness was higher in subjects with raised CA125 (8.71 years) as compared to those with normal CA 125 (6.67 years) and the difference was also statistically significant ($P<0.001$).
Conclusions: CA-125 levels have a good sensitivity and specificity for predicting right ventricular failure in COPD patients. Diagnostic accuracy, high positive and negative predictive value makes CA-125 a good predictor of right ventricular failure in COPD patients.

Keywords: CA-125, COPD, Right heart failure

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is accepted as one of the major cause of morbidity as well as mortality across the globe. As per recent World Health Organization (WHO) estimates, more than 65 million people have moderate to severe COPD and it is estimated to be the third major cause of death by 2030.[1]

It is a progressive disease and some patients may develop pulmonary artery hypertension and cor pulmonale, which worsens the prognosis. Echocardiography examination of the heart is used for diagnosis and confirmation of presence of pulmonary hypertension as well as cor pulmonal.[2]

Recently, CA-125 which is a high molecular weight glycoprotein normally produced by endometrial, peritoneal and ovarian cells has been observed to be raised in patients suffering from congestive heart failure and consistently designated as a new marker with potential role in heart failure.[3-6] In this study, we aimed to show whether measures of RV function could be related to CA-125 levels among patients with COPD.

METHODS

A total of 178 patients with moderate to severe COPD who were admitted in SMS hospital were taken for study after applying inclusion and exclusion criteria.

Inclusion Criteria

- All patients with signs and symptoms of COPD diagnosed clinically and who met the GOLD criteria for COPD.

Exclusion Criteria

- Previous history or current evidence of malignancy
- Active inflammatory disease including those during index exacerbation yielding hospitalization of patient
- Significant accompanying left-heart pathology
- Patients with chronic lung disease other than COPD
- Congenital, rheumatic or ischemic heart disease
- Systemic Hypertension and Diabetes mellitus
- Any systemic disease causing pulmonary hypertension
- Patients who were not able to perform spirometry

RESULTS

Authors enrolled total 178 patient suffering from moderate to severe chronic obstructive pulmonary disease (COPD). 131 were males and 47 were females. Serum CA-125 were calculated among all patients. The mean age of subjects with raised CA-125 was (71.1±8.45) as compared to those with normal CA -125 levels (65.2±8.96).

Table 1: Comparison of mean duration of illness (years) of study subjects.

Group	N	Mean (years)	Std. deviation
CA 125 normal	75	6.67	2.23
CA125 raised	103	8.71	2.56

In present study authors compared the duration of illness of disease with the study subjects. the mean duration of illness was higher in subjects with raised CA125 (8.71 years) as compared to those with normal CA 125 (6.67 years) (Table1) and the difference was statistically significant (P<0.001).

In present study after echocardiographic assessment, 101 patients were having right ventricular dilatation and 77 patients had normal size.

Authors compared function of right ventricle with the levels of serum CA 125. The mean CA125 was higher in subjects with RV failure (96.32) as compared to those subjects with RV normal (37.17) (Table 2). The result was statistically significant. (p<0.001).

Table 2: Distribution of study subjects according to RV Failure and serum CA 125 levels.

CA 125 value	RV failure		RV normal		Total	
	N	%	N	%	N	%
Raised	83	80.6	20	19.4	103	100
Normal	19	25.3	56	74.7	75	100
Total	102	57.3	76	42.7	178	100

Table 3: Diagnostic parameter of CA125 for detecting RV failure.

Diagnostic parameter	Value	95% CI
Sensitivity	81.37%	72.45 - 88.40%
Specificity	73.68%	62.32 - 93.13%
Positive likelihood ratio	3.09	2.01 -4.56
Negative likelihood ratio	0.25	0.16 - 0.39
Positive predictive value	80.58%	73.8 - 85.94%
Negative predictive value	74.67%	65.78 - 81.88%
Diagnostic accuracy	78.09%	71.89 - 84.29%

In present study, authors assessed the diagnostic parameters of CA125 for detecting RV failure. Serum CA 125 had good sensitivity (81.37%) and specificity (73.68%) for predicting RV failure in COPD patients. Overall diagnostic accuracy of CA125 in predicting RV failure was 78.09%. A high positive and negative predictive value makes CA125 a good predictor of RV failure for individual patient.

Above graph shows that the AUC for CA125 for detecting RV failure in COPD patients is high (0.820) which was statistically significant at P< 0.001.

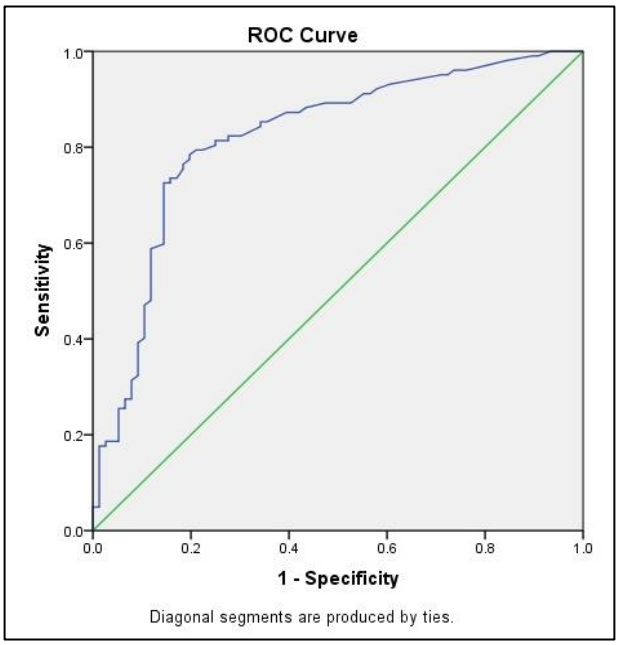

Figure 1: ROC curve for CA125 for differentiating RV failure.

DISCUSSION

Chronic obstructive pulmonary disease is a debilitating disease with frequent exacerbations. The prognosis is further compromised with the addition of RV failure. Hence, it may be important to recognize the situation early in order to intervene timely with the aim to improve quality of life. Pulmonary hypertension and RV dysfunction are well known to complicate the course of illness and adversely affect the survival and quality of life. Significant changes in the pulmonary hemodynamics lead to increased pulmonary vascular resistance, resulting in pulmonary hypertension. The pulmonary hemodynamics worsens with worsening airflow obstruction.[7,8]

Brain natriuretic peptide was previously shown to be related to clinically apparent RV failure in patients with COPD. Patients with clinically diagnosed cor pulmonale had higher brain natriuretic peptide levels than non–cor pulmonale patients. CA-125 seems to be different from other biomarkers such as BNP which are released secondary to acute stress. Hence, CA-125 might help in identification of RV dysfunction, which imposes stress on the splanchnic bed, in patients with COPD before it becomes clinically apparent cor pulmonale.[9,10]

Present study included 178 subjects with COPD of which 131 were males (73.6%) and 47 were females (26.4%). The mean age of study subjects was 68.6±9 years and male female ratio was 3.8:1. The higher incidence of COPD in males can be attributed to smoking. The male-female distribution in this study is in line with that of JC Banergae, who reported 80% male population.[11] Chappel AG also showed 81.25% male distribution in a study on chronic bronchitis and emphysema.[12]

The mean duration of illness was 7.8±2.6 years. Maximum number of subjects (82.6%) had symptoms for less than 10 years and 17.4% of them had symptoms for >10 years and the frequency of stage 2, 3 and 4 COPD by GOLD classification was 32.6%, 41.0% and 26.4% respectively.

In present study we compared the serum CA-125 levels with the right ventricular failure. The level was significantly higher in patients with RV failure. Similar study by Bulut ET al in which among 53 patients with COPD, those with cor pulmonale had significantly higher mean serum levels of CA-125, CEA, and CA 19.9 with $p < 0.05$.[9] Brain natriuretic peptide (BNP) and CA-125 were significantly higher in patients with congestive heart failure than in those without congestive heart failure

Another study by Ordu et al in which they measured proBNP and CA-125 in 102 patients with congestive heart failure and concluded that: baseline NT-proBNP and CA-125 levels are comparably reliable as heart-failure markers and suggested that CA-125 can be used for prognosis prediction in heart failure.[10]

CONCLUSION

CA-125 levels have a good sensitivity and specificity for predicting right ventricular failure in COPD patients. Diagnostic accuracy, high positive and negative predictive value makes CA-125 a good predictor of right ventricular failure in COPD patients. We believe further studies are needed in which CA-125 is used to risk-stratify patients with COPD based upon its performance on identification of RV failure in patients with COPD.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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