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Evaluation of cardiac troponin-i in acute exacerbation of chronic obstructive pulmonary disease: A short study

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Abstract

Background: Chronic Obstructive Pulmonary Disease (COPD) is often associated with pulmonary hypertension, and increased risk factors for cardiovascular diseases. Numerous studies have been carried out to study levels of Cardiac Troponin – I (cTnI) in COPD patients.

Objectives: In this prospective study, the levels of cTnI are evaluated in 50 patients with acute exacerbation of COPD and are compared with mortality, need for and duration of ventilation and length of stay in hospital.

Materials and Methods: 50 patients of COPD who met the inclusion and exclusion criteria were included in this study. According to presence of cTnI, they were divided in two groups – one with presence of cTnI and other being negative for presence of cTnI. Different parameters like stay in ICU, non-invasive or invasive ventilation as well as mortality were studied in these patients and statistical analysis carried out to correlate with levels of cTnI.

Results: Out of 50 patients, 46 were males and 4 females. cTnI was found to be positive in 19 patients. Elevated cTnI was found to be associated with higher prevalence of cor pulmonale and severe pulmonary hypertension. Patients in positive group had higher incidence of left ventricular dysfunction.

Conclusion: cTnI is found to be elevated in significant number of patients with COPD, especially in acute exacerbation of COPD cases. It can be used as an independent marker to identify high risk patients at the time of admission in hospitals.

Keywords: Chronic Obstructive Pulmonary Disease, Troponin I, Mortality, Cardiac injury, ventilator.

Introduction

Chronic Obstructive Pulmonary Disease (COPD) is a lung disorder characterized by limitation of airflow (not fully reversible) and is a prominent etiological factor of chronic respiratory insufficiency and cor pulmonale.[1]

Patients with acute exacerbations of Chronic Obstructive Pulmonary Disease (COPD) have an increased frequency of cardiovascular risk factors and cardiac co-morbidities are commonly seen in such patients.[2] COPD is the 4th ranked among the cause of death worldwide and is an both preventable as well as treatable challenge to public health.[3] By 2030, COPD is expected to climb further and become 3rd leading cause of death, according to prediction by World Health Organization (WHO).[4] Lung cancer, metabolic syndrome, cardiovascular diseases, depression, osteoporosis are some of the comorbidities coexisting with COPD.[5]

Systemic inflammation in case of acute exacerbations of COPD cases causes extrapulmonary symptoms also, apart from the hallmark symptoms of COPD exacerbation i.e., cough, increased sputum and dyspnoea.[6] During exacerbations of COPD cases, there is always an associated increase in cardiac burden as suggested by Currie et al.[7] and hence it is likely to release Cardiac Troponin I (cTnI) in such situations and thus cTnI could have possible prognostic implications.

This study aims to evaluate the incidence of cTnI elevation in patients with acute exacerbation of COPD as well as to study the association of elevated cTnI with other aspects like mortality, length of stay in hospital, need for invasive / noninvasive ventilation and ICU admission.

Materials and Methods: 50 patients with admitted to Government Medical College, Surat with acute exacerbation of COPD were included in this study. Inclusion criteria was patients with acute exacerbations of COPD, whereas patients with renal failure, pulmonary embolism, myocardial infarction, sepsis, cardiac arrest prior to hospitalization, were excluded from the study.

cTn1 levels were measured at the time of hospitalization and also a day later. The levels above the cut off range of 0.017 µg / L were considered as positive for cardiac troponin I and the patients were divided in to two groups; Group 1 with 19 patients positive for cTnI and Group 2 with 31 patients negative for cTnI.

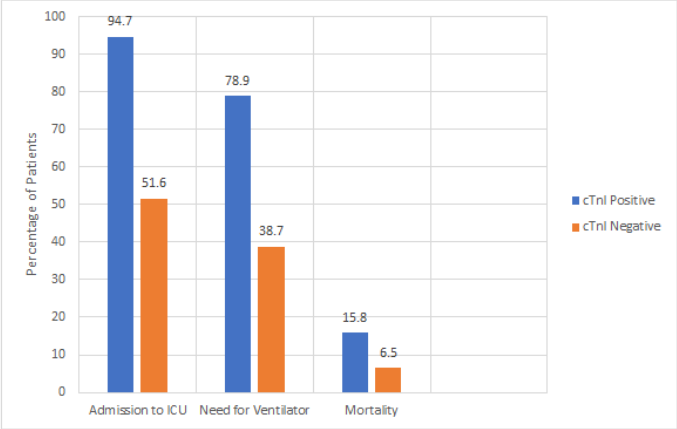
Statistical Analysis & Results

Out of total 50 patients (4 females and 46 males), 38% patients showed positive results for elevated cardiac troponin I levels and 62% showed negative results for the same (Table 1). Admission to ICU, need for ventilation and mortality of patients according to levels of cTnI are shown in Graph 1.

Variables such as admission to ICU, non-invasive or invasive ventilation, duration of ventilatory support and length of stay in hospital including ICU stay along with Mortality rate were correlated with cTnI levels and level of significance was calculated with $p<0.05$ as significant. (Table 2)

Troponin	No. of patients	%
Positive (Group 1)	19	38.0
Negative (Group 2)	31	62.0%
Total	50	100%

Table 1: Frequency distribution of patients according to Troponin levels (levels higher than 0.017 µg / L is considered as positive)



Graph 1: Percentage of patients requiring admission to ICU, requiring need for ventilator and mortality rate among cTnI positive and negative groups.

Variables	cTnI positive (>0.017 µg / L) n = 19	cTnI negative (<0.017 µg / L) n = 31	P value
Admitted to ICU	18 (94.7%)	16 (51.6%)	0.002
Non-invasive/ Invasive Ventilation	15 (78.9%)	12 (38.7%)	0.006
Duration of Ventilatory Support (median)	4.0	4.0	1.000
Length of stay in days			
In ICU	5.56 ± 1.95	5.56 ± 5.49	0.996
In hospital	8.94 ± 4.46	8.61 ± 4.25	0.792
Mortality	3 (15.8%)	2 (6.5%)	0.285

Table 2: Admission to ICU, non-invasive or invasive ventilation, duration of ventilatory support and length of stay in hospital including ICU stay along with Mortality rate correlated with cTnI levels and level of significance calculated with $p<0.05$ considered as significant.

Discussion

Out of 50 patients, 38% had elevated levels of cTnI, suggesting that some form of cardiac injury is present in patients of acute exacerbations of COPD. Apart from the traditional hallmark features of COPD, systemic inflammation in acute exacerbations of COPD can lead to extrapulmonary symptoms also as mentioned in Table 3.

System involved	Symptoms
Cardiac	Tachycardia Tightness in Chest region
Systemic	Fatigue Malaise Increased body temperature (Fever)
Psychiatric	Insomnia Confusion Depression Sleepiness
Pulmonary	Cough Dyspnea Wheezing Tachypnea Change in volume and colour of sputum
Musculoskeletal	Decline in exercise tolerance

Table 3: Symptoms of COPD Exacerbation [6]

Different factors are responsible for increasing the risk of severe COPD exacerbations like poor physical activity levels, poor social support, body mass index of 20 kg per m^3 or less, at least 3 exacerbations in last 12 months, altered mental status, marked increase in symptoms or change in vitals, Severe baseline COPD (FEV_1 / FVC < 0.70, FEV_1 < 50% of predicted) and underutilization of home oxygen therapy. (FEV_1 is forced expiratory volume in 1 second, FVC – forced vital capacity) [6]

In the present study, cTnI was found to be elevated during exacerbations of COPD which is coinciding with the findings of Baillard[2] and Saleha Noorain[8]. Also, the findings of admission to ICU and non-invasive / invasive ventilation correlated with elevated cTnI levels in statistically significant manner with p values respectively being 0.002 and 0.006. These findings are in agreement with the findings by Saleha Noorain.[8]

Elevated cTnI was found to be associated with higher prevalence of cor pulmonale and sever pulmonary hypertension as well as higher incidence of left ventricular dysfunction. This is totally in agreement to findings of Baillard[2] who has stated that risk factors for left ventricular dysfunction and cardiovascular disorders are common in COPD patients.

Ischemic heart disease was seen in higher percentage in patients with COPD and lower SpO_2 was also observed in such patients. No significant difference was found in the length of stay in ICU and length of stay in hospital.

Conclusion

Cardiac Troponin I levels are found to be elevated significantly in patients with acute exacerbations of COPD. cTnI can be considered as an individual predictor for ICU admission and requirement of ventilator support, though it did not predict in-hospital mortality and thus it can be a useful market to identify high risk patients at the time of hospital admission. Further research with larger sample size may yield better results on comparing different parameters with elevated cTnI levels in patients with exacerbations of COPD.

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