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CARDIAC TROPONIN IN RISK STATIFICATION OF PULMONARY EMBOLISM

Clinical Research

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ABSTRACT

OBJECTIVES: Cardiac troponin I (TROP I) is a highly sensitive, specific marker for myocardial cell injury. In patients with severe pulmonary embolism (PE), myocardial ischemia may lead to progressive right ventricular dysfunction. In this study, we aimed to analyze the elevated cardiac troponin I levels its prognostic implications in patients with confirmed PE.

METHODS AND RESULTS: 28 patients with confirmed PE were enrolled in this prospective study . Cardiac Troponin was measured at the time of admission . Severity of PE was assessed by clinical data. TROP I was elevated (>0.4ng/ml) in 4 (66.6 %) patients with massive and 2 patients in submassive (33.3%) PE but not in patients with non massive PE. In-hospital death (P<0.001), and need for resuscitation (P =0.04)were more prevalent in patients with elevated Troponin I . TROP I positive patients more often needed inotropic support and mechanical ventilation . All patients with elevated TROP I required thrombolytic therapy .

CONCULSION: TROP I aids in the identifying the risk ,early an d vigorous management of severe pulmonary embolism.

KEYWORDS

Pulmonary embolism Echocardiography Troponin I Risk Stratification

INTRODUCTION

Pulmonary embolism (PE) is the occlusion of the pulmonary artery or its branches with various substances such as thrombus, fat, air, bone marrow, amniotic fluid and septic material. It is commonly originated from the thrombi in the deep leg veins.[1]

Cardiac troponins were also shown to correlate closely with prognosis and increased risk of death in medically treated patients presenting with acute pulmonary embolism, being released as a consequence of myocardial injury and right ventricular (RV) dysfunction resulting from acute increase of RV afterload.[3]

Recently, Cardiac troponins was reported to predict in-hospital death in patients with acute PE, and elevated Cardiac troponins levels were observed in patients with submassive PE[2]. Cardiac troponins levels can be used to distinguish between low-, intermediate-, and high-risk patients and are thus valuable parameters for emergency triage of patients with PE.

MATERIALS AND METHODS

This study is a prospective single-centre study, including 28 consecutive patients at KIMS HOSPITAL AND RESEARCH CENTRE between December 2018 and march 2020.

Patients' informed consent was obtained where applicable and the study was approved by the institutional ethics committee.

TROPONIN I MEASUREMENT

Venous blood samples were collected to test for highly sensitive troponin T levels(fluorescence immunoassay run on Beckman Coulter analyser)and the test was accepted as positive if the highly sensitive troponin level was >0.4 ng/ml.Blood samples that were analyzed for troponin I were also examined for D-dimers.

INVESTIGATIONS

Pulmonary embolisms was confirmed by computer tomography pulmonary angiogram .

All consecutive patients in whom the diagnosis of pulmonary embolism was made underwent echocardiographic examination.The patients with PE were divided into three groups according to the clinical and hemodynamic features, as follows: massive PE (shock and/or hypotension), sub-massive PE (RVD on TTE, but hemodynamically stable) and nonmassive PE.

Patients' baseline characteristics (sex, ages, etc.) were recorded along with co-morbidities, symptoms, haemodynamic conditions, all-cause mortality rates during hospitalisation, the duration of hospital stay, radiographic test results, and laboratory findings, and electrocardiography were also obtained during admission.

DEFINITION OF CLINICAL END POINTS

The predefined clinical end points of the study were overall mortality and complicated course, defined as death or 1 of the following: need for thrombolytic treatment, inotropic support of blood pressure , endotracheal intubation, or cardiopulmonary resuscitation.

Statistical Analysis

The prognostic relevance of TROP I and other important baseline parameters with respect to the major end points PE was analyzed uni variately by Fisher's exact test.Mean values were taken for continuous variables and p value of less than 0.05 is considered as significant.

RESULTS

28 consecutive patients who were diagnosed as pulmonary embolism by CT pulmonary angiography was taken into the study .Base line clinical characteristics of the patients are shown in table 1 .The mean age of the study population was 54.35 years with 60 % being males .

Trop I was elevated in 21.42 % of the patients .Over all 78.5 % presented with dyspnea . 31.25 % of patient with chest pain had TROP I elevated .All the patient with Trop I >0.4 ng/dl presented with dyspnea.

Table 2 shows diagnostic findings of the study population. Among the patient with elevated TROP I 66.6 % had massive pulmonary embolism ,while remaining had submassive pulmonary embolism . The mean blood pressure was 90/60 mm hg in patients with elevated TROP I .83.3 % had hypotension in patients with elevated Trop I . The mean D dimer was higher in patients with elevated TROP I compared to over all patients .ECHO showed RA ,RV dilated in 100 % of the patients with elevated TROP I Patients with raised trop I had respiratory failure.

The in hospital death and complications shown in table 3 which shows over all in hospital death was 21.42 %. Death among patients with elevated TROP I was 83.33 % , need for inotropes in all patients with elevated TROP I . 66.6 % of patient with raised TROP I needed mechanical ventilation when compared to other group , which was only 18.18 % . All the patient in elevated TROP I needed thrombolytic therapy , and had a longer ICU as well as hospital stay . Patient with TROP I <0.4ng/ml shorter in hospital stay and were followed up on outpatient basis.

Table 1: Baseline Clinical Characteristics

CLINICAL CHARACTERISTICS	All Patients (n=28)	TropI <0.4 ng/ml (n=22)	TropI> 0.4 ng/ml (n=6)

AGE (MEAN) IN YEARS	54.35	51.8	56.9
MALE	15(60)	11	4
CLINICALFEATURES			
DYSPNEA	22(78.5)	16	6
CHESTPAIN	16(57.14)	11	5
LOWERLIMBSWELLING	14(50)	11	3
COMORBIDITIES			
DIABETIES	8(28.57)	2	6
HYPERTENSION	8(28.57)	2	6
CAD	2(7.14)	1	1
MALIGNANCY	2(7.14)	1	1
PREVIOUSHISTORY OF THROMBOEMBOLIC EVENT			
DVT	7(25)	4	3
OTHERE MBOLIC EVENT	3(10.7)	3	0

CAD coronary artery disease .DVT deep vein thrombosis .

Table 2 :Diagnostic Findings of Study Population

	ALL PATIENTS (n=28)	TROPI <0.4 ng/dl (n=22)	TROPI >0.4 ng/dl (n=6)
SEVERITY OF PE			
MASSIVE	6	2	4
SUBMASSIVE	7	5	2
NONMASSIVE	15	15	0
HAEMO DYNAMIC FUNCTION			
HEART RATE(BPM)	108	101	116
BLOODPRESSUREin mmHg	100/70	110/80	90/60
SYSTEMIC HYPOTENSION	6	0	5
DDIMER	2641.42	2450	2832.4
ECHOFINDING RA, RVDILATION	10	4	6
DVT	14	11	3
FIO2 MEAN MM HG	67.9	81.2	53.2

Table 3: In-hospital Death And Complications

	ALL PATIIENTS n=28	TROPI <0.4 ng/dl (n=22)	TROPI >0.4 ng/dl (n=6)	p
In-hospital death	8	3	5	<0.001
Need of inotropic drugs	8	2	6	0.001
Resuscitation	7	1	6	0.04
Mechanical ventilation	8	4	4	0.25
Thrombolytic therapy	8	2	6	0.001
Heparin therapy	22	22	0	0.001
Length of ICU stay (range), d	3days	2	4	0.7
Length of hospital stay(range), d	6.5days	5	8	0.01

ICU -intensive care unit

DISCUSSION

Pulmonary embolisms is responsible for about 10% of hospital mortality . In Acute PE an increase in cardiac Troponin is seen because of the sub endothelial ischaemia in the right ventricle . In many studies the prevalence of elevated Trop I in patients with PE was found to be as high as 50%.

In the present study Trop I levels were high in massive and submassive PE cases which are similar to study of Evangelos Giannitsis, et al [7].RA and RV dilation was found in high percentage of cases with elevated Trop I . This was similar to studies of Goncoklinc et al [1] .In the study done by Ayman el menyar [5] the negative predictive value of TROP I level was found to be useful for identifying low risk patients that could be managed without hospitalization .

In the present study ,patients with elevated TROP I was associated with increased mortality , mechanical ventilation .All the patients with elevated TROP I levels had to under go thrombolytic treatment ,many studies imply that troponin levels are sensitive markers in identifying the risk of delay in treatment . The study done by Karin janata etal over a period of 12 years on 196 patients showed that araised levels in troponin levels had higher in hospital mortality in patients with pulmonary embolism.[8]

A meta-analysis of studies in patients with acute pulmonary embolism to assess the prognostic value of elevated troponin levels for short-term death and adverse outcome event study done by Cecilia Becattini etal.,[6] showed that elevated Troponin levels identify patients with acute PE at high risk of short term death and adverse out come events.

LIMITATIONS

The present study is limited by a 1 shortcoming. Sample size is not sufficiently large to allow detailed statistical investigation of all competing prognostic risk factors.

CONCLUSION

Elevated Trop I levels are associated with higher risk for in-hospital mortality and complicated clinical course. Additional studies are needed to assess whether troponin levels, alone or in conjunction with other tests, can be used to guide therapeutic strategy and improve the prognosis of patients with PE.

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