Original Article

The Utility of Cardiac Troponin I in Predicting the Disease Severity in Hospitalized Patients with Community Acquired Pneumonia

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Abstract

Background: Cardiac Troponin iso-enzyme I (cTnI) is known as a specific biomarker of myocardial damages. CTnI rises in various systemic non-cardiac diseases and assumed as an important prognostic factor. Excluding the patients presenting with acute cardiac problems, in this study we investigated the relationship between serum cTnI elevation and the severity of disease in hospitalized patients with CAP. **Methods:** From March 15, 2014 to April 2015, through a prospective cohort study, hospitalized patients with CAP were included. Patient were excluded if: recent hospitalization with possibility of hospital acquired pneumonia; on admission intubation; ABG obtained after two hours of admission; ABG obtained while the patient was on supplemented oxygen. Patients, with previous or current history of congestive heart disease and those with clinical and ECG finding compatible with acute coronary syndrome, acute pericarditis or acute myocarditis and those with associated renal failure were excluded. CTnI was obtained on admission and 3rd day and CURB-65 and pneumonia severity index (PSI) were calculated for each patient. **Results:** Of 65 patients, 27 patients were included (M/F: 15/12, Age: 64.2 ± 14.4 yrs). Troponin was positive in 14/27. A significant correlation was found between 3rd day cTnI titer and CURB-65 (r=0.43, P=0.02) and PSI score (r=0.56, P<0.01). PSI and CURB-65 scores were significantly greater in those who the cTnI became positive at 3rd day (125.5 ± 41.7 vs. 82.2 ± 27.4; P=0.01 and 2.3 ± 1.0 vs. 1.1 ± 0.7; P=0.01 respectively). There was no significant age and gender associated cTnI importance. **Conclusion:** In this study significant association was found between cTnI increasing titer within first third days of hospitalization and pneumonia severity index/CURB-65. We recommend serial monitoring of the level of this marker (at least in first 3 days) in order to predict the disease severity in hospitalized patients with CAP.

Keywords: Community-acquired pneumonia; Cardiac troponin; Pneumonia severity index; CURB-65

Introduction

Laboratory findings could have various degree of prognostic significance in community acquired pneumonia (CAP).[1] Cardiac Troponin iso-enzyme I (cTnI) is known as a specific biomarker for myocardial damages.[2] This biomarker could also rises in other critical conditions such as sepsis, pulmonary embolism or stroke in patients' blood; addition to myocardial damage.[3-5]

High troponin level in critically ill patients is associated with poor outcome.[5] However, there is few data regarding the significance of cTnI in CAP.

In this study, we investigate the relationship between blood levels of cTnI and the severity of disease (assessed by CURB-65 and pneumonia severity index) in hospitalized patients with CAP.

Methods

Patients

From October 2015 to February 2016, by a prospective study, patients presented to a University General hospital with the clinical/imaging findings characteristic of CAP were included. Patients, with congestive heart disease and those with clinical and ECG finding compatible with acute coronary syndrome, acute pericarditis or acute myocarditis and those with associated renal failure were excluded. Those with possible nosocomial infection, associated immune deficiency and history of recent active tuberculosis were also excluded. On the first and third day of admission, blood samples was obtained and sent to the laboratory for measuring cTnI. The study was approved by the Ethics Committee of Tehran University of Medical Sciences.

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CURB-65 and pneumonia severity index (PSI)

On first day of admission, CURB-65 and pneumonia severity index (PSI) were calculated for each patient. CURB65 score includes the following five items: Confusion, age older than 65 years, respiratory rate >30/minute, urea >20 mg/dl and hypotension (SBP<90 mmHg or DBP<60 mmHg). [6,7] PSI is another scoring system is an useful and comprehensive scoring system for short term outcome assessment in CAP. [8] This scoring system includes 3 demographic features, 5 associated comorbidities, 5 findings on physical examination, 6 laboratory measurement and 1 imaging finding. Then the patients will be categorized to 5 class from class I (least severe) to class V (most severe) CAP. [9]

cTnI

Specimens were obtained on 1st and 3rd day of presentation. CTnI was measured by enzyme-linked fluorescence assay (ELFA) method (VIDAS, bioMérieux, France) with measuring range of 4.9 to 40,000 ng/l. CTnI test kit (BioMérieux, France) with 1.3-3.2 ng/l limit of detection was used in this study. This test kit has 95.2% specificity and 97.7% sensitivity.

Statistical analysis

Pearson's R test was used for analyzing the correlation between the continuous variables. For comparing continuous variables in cTnI-positive and cTnI-negative group Independent two-sample t-test was used if variables were normally distributed. Mann-Whitney test was used if distribution of the difference was skewed. For categorical variables Chi-square test was used. P value less than 0.05 was considered significant.

Results

Out of 65 patients, 38 patients were excluded. Of the 27 remaining patients, 15 (55.56%) were males and mean age of patients were 64.2 ± 14.4 years. Troponin was positive in 14/27. Significant correlation was found between 3rd day cTnI titer and on-admission CURB-65 (r=0.43, P=0.02) and PSI score (r=0.56, P<0.01). However no significant correlation was found between 1st day cTnI value and either on-admission CURB-65 or PSI scores (P= 0.44 and 0.11 respectively). Table 1 shows the comparison between the variables in those with positive cTnI level (in either 1st or 3rd day) and those with negative results.

On-admission PSI and CURB-65 scores were significantly greater in those who the cTnI became positive on 3rd day (125.5 ± 41.7 vs. 82.2 ± 27.4; P=0.01 and 2.3 ± 1.0 vs. 1.1 ± 0.7; P=0.01 respectively). On the other hand, in those with decreasing troponin titers, significant improvement in leukocytosis and arterial oxygen saturation were found in 3rd day (P =0.04 and P <0.01 respectively). Patients ≥65 years, had significantly higher PSI and CURB-65 score compared with those <65 years (104.4 ± 28.8 vs. 68.9 ± 26.9; P<0.01 and 1.8 ± 0.6 vs. 0.7 ± 0.6; P<0.01 respectively).

Discussion

Although there is no single reliable marker for prediction of short-term and long-term outcomes in CAP, there are many studies showing the usefulness of various markers in predicting CAP outcome. In a prospective longitudinal study in hospitalized with CAP, C-reactive protein was a co-factor for PSI and CURB65 scales regarding 30-day mortality prediction. [10] In another study about the role of on admission arterial PCO_2, [11] hypercapnic patients hospitalized for longer duration compared with normocapnic subjects. [12] There is other studies showing a strong relation even between novel cardiac/inflammatory biomarkers (e.g., Midregional proadrenomedullin) and CAP severity/outcome. [13] These evidence emphasize the fact that there is a great role for serum markers in prediction of CAP outcome. Among these markers, the cardiac-related markers have special place. In this study similar to the previous studies, important prognostic role was found for cTnI, as an important marker of cardiac damage in CAP patient without associated acute coronary syndrome or preexisting cardiac diseases.

Table 1: The comparison of variables between cTnI-positive group (in either 1st or 3rd day) and cTnI-negative one.

Variables	cTnI positive (n=14)	cTnI negative (n=13)	P-value
Age	65.1 ± 15.0	63.2 ± 14.2	0.73
Male/Female			
Respiratory Rate (/min)	25.4 ± 8.0	20.0 ± 4.5	0.03*
Arterial O_2 sat (1st day)	90.6 ± 4.0	91.44.3	0.61
Arterial O_2 sat (3rd day)	90.4 ± 4.6	94.0 ± 3.6	0.03*
WBC /µl (1st day)	9824 ± 3968	9869 ± 2284	0.97
WBC /µl (3rd day)	10400 ± 2830	7853 ± 2231	0.01
CURB-65 score	1.57 ± 0.8	1.0 ± 0.8	0.08
PSI score	102.3 ± 30.2	74.0 ± 30.1	0.02*

*P-value is significant.
cTnI: Cardiac Troponin iso-enzyme I
PSI: Pneumonia Severity Index;
WBC: White Blood Cell

There is a great concern that a single episode of CAP could trigger a cardiac event. [14] A systematic review and meta-analysis of observational studies in patients with CAP showed that major cardiac complications ensue in a significant number of these patients. [14] They found that the incident of overall cardiac complications was 17.7% (confidence interval [CI] 13.9–22.2) among these patients. In another study, [15] the occurrence of cardiac events were associated with higher risk of 30 days mortality, even after adjustment for baseline PSI score (OR, 1.6; 95% CI, 1.04–2.5). In general practice, it is expected from an uncomplicated CAP to respond to antimicrobial treatment within first 3 days of treatment initialization. [16] Surprisingly, in this study, significant correlation was also found between CAP severity and cTnI levels in 3rd day. However in spite of significant relations between increasing titer of cTnI and PSI/CURB-65 score, no significant correlation was found between on admission level of cTnI and severity scores. This could be due to excluding the patients with clinical/paraclinical presentation compatible with acute coronary syndrome. On the other hand, cardiac events could be the final most drastic complication of many systemic diseases including CAP. It could explain the importance of 3rd day cTnI, the time that the complicated disease has progressed in its downhill course.

In spite of the low number of cases and short term follow up

time, the prognostic usefulness of cTnI has been reached to statistically significant values. Large prospective studies are required to confirm the long term prognostic importance of this cardiac marker in patients presenting with CAP.

Conclusion

In conclusion, significant association was found between cTnI increasing titer within first third days of hospitalization and pneumonia severity index/CURB-65, in this study. We recommend considering this valuable marker (at least in first 3 days) as a predictor of disease severity in hospitalized patients with CAP.

Conflict of Interest

All authors disclose that there was no conflict of interest.

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